ELECTRICAL REVIEW

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Gatling Gun Operated by Electric Motor.

The range of uses to which electric motors have been put has become so broad that one might easily suppose a limit had been reached, and the whole field of possibilities covered, and yet we find almost daily some new purpose to which this most convenient and efficient form of energy may be applied.

The latest and decidedly the most novel use of the electric motor is to replace human energy in the manipulation of the death-dealing Gatling gun. The Crocker-Wheeler Motor Company, of this city, at the request of the United States Navy Bureau of Ordnance, submitted plans by which the Gatling gun might be operated by electricity, and have just completed a motor attached to the breech of the gun which is a marvellous success.

It has been necessary, heretofore, in operating these guns, to have the services of two men, the gunner, whose duty it is to train the gun and drop the shot where they will do the most execution, and also a man to operate the crank which sets in motion the mechanism which causes the balls to hail down upon the enemy.

The adaptation of the Crocker-Wheeler motor not only does away with the services of the latter, but enables the gunner to train and operate the gun at will by touching an electric button.

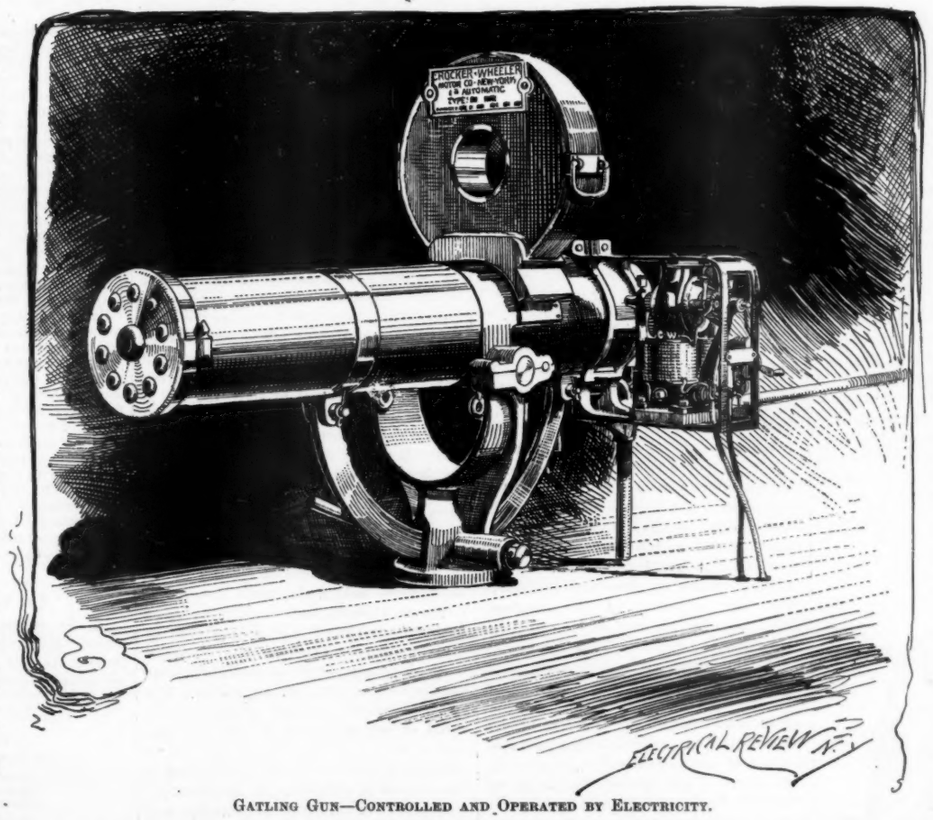
So completely is the Gatling under control of the gunner, that he is enabled to fire either a *single* shot, or to pour them out at the rate of 1,200 per minute.

The motor is attached to the breach of the gun, and moves with it in every direction. It is so arranged that it may be disconnected from the gun mechanism instantly, by means of a specially defined clutch, should the motor be damaged by shot or otherwise, when the crank referred to may be used.

The Bureau of Ordnance expects that a gunner will be able to do more execution when not disconcerted by the man at the crank, as the power is applied more steadily, and because of the absence of wabbling which is unavoidable when operated by a man.

We publish an illustration of the electric Gatling gun, and have no doubt it will be of much interest to the general as well as the electrical reader.

A test was made Friday afternoon, September 26th, near Norton's Point, Long Island, of the electric motor and Gatling gun. The gentlemen present were Captain McCormick, U.S.N., Captain West, U.S.N., Lieut. Ames, U.S.N., Inspector of Ordnance at Hartford, and Mr. T. McCoubray, of the Crocker-Wheeler Co. The test was very satisfactory, 3,000 rounds being fired. It was found possible to fire a single shot and stop, or fire 1,000 rounds per minute,



Gatling Gun—Controlled and Operated by Electricity.

The Iron and Steel Men.

The most important meeting of men interested in the iron and steel industries which has ever been held in this country began on Monday, September 29th, at Chickering Hall.

The American Institute of Mining Engineers and other organizations are entertaining their foreign brethren from the following societies: The Iron and Steel Institute of Great Britain sends about 200 members; the Verein Deutscher Eisenhüttenleute, the leading German iron and steel association, about 100 members; and a large number of French, Belgian and Swedish metallurgists. The occasion will be noteworthy, as the British Institute is to hold a special meeting while here. A number of intensely interesting papers will be read and discussed, among others, one by Professor Elihu Thomson, on "The Thomson Electric Welding Process."

The week will be spent here in New York in business meetings and the reading and discussion of numerous papers. On Saturday everybody who is invited will take the Pennsylvania Railroad for Philadelphia, going from there to Lebanon, Harrisburg, Altoona, Pittsburgh and Chicago. They will return to New York about October 28th and then adjourn.

Over $100,000 has been collected with which to entertain the eminent foreigners, and any additional sum necessary to take care of them in the best manner possible will be forthcoming.

It will be remembered that last year a large number of American engineers, including many members of the Electric Club, were very cordially entertained in Great Britain, a great many clubs over there offering the freedom of their houses. On account of the conservative rules of many of the English clubs, forbidding the introduction of strangers under any conditions except to certain portions of the club houses, they went so far as to make the visiting Americans honorary members during their stay in Great Britain, so that they might have full privileges.

In return for this delicate courtesy, the New York Electric Club will furnish every delegate to the Iron and Steel meetings a card which will entitle them to the entire freedom of the club for a fortnight.

Edison Light Tower at Portland, Ore.

At the electrical exhibition now being held in Portland, Ore., there has been erected a tower covered with Edison incandescent lamps. It is similar to those shown at Paris, the Lenox Lyceum in this city and recently at the Minneapolis Exposition. This one at Portland is set in a bank of flowers, and together with the festoons uses about 3,000 lamps of four candle-power each. The Edison lamp factory at Harrison, N. J., recently received a telegram stating that the tower had been completed in time for the opening night of the exhibition, and proved a great attraction and success.

The Electric Club, New York.

The preparations for the first dinner of the season at the Electric Club, to be given this week, would indicate a successful event. A large attendance is assured.

The New York *Press*, one of the most enterprising of metropolitan dailies, contained over two columns of interesting club news last Sunday. This will undoubtedly prove a valuable and much-read feature of the *Press*. Among others, it contained the following items about the Electric Club: "Electric Club men maintain that Steward Stadler has no superior among metropolitan chefs in the evolution of steaks and chops." "The Electric Club will inaugurate its Fall and Winter meetings with a dinner at the club-house October 2. Covers will be laid for 100 persons. The club's popular course of lectures and talks on scientific subjects will be resumed late in October."

Through the upsetting of a boat, launched from the Marine and Field Club, Long Island, President Madden, of the Electric Club, was thrown overboard and enjoyed the sensations attributed to one McGinty. The gallant swimmers of the Marine Club came promptly to the rescue, and the genial president was promptly rescued. Later in the day, a brave diver, J. C. Chamberlain, went below and brought up a package that fell into the water from Gen. Madden's hand, and thus everybody and everything was saved. But the enterprising tailor that gets to Mr. Madden's office early will get an order for a new suit of clothes, and the ditto watchmaker will find a well soaked watch that needs drying.

At the last meeting of the board of managers of the Club, the following named applicants were elected members:

Resident members—Louis D. Beck, Robt. H. Read, Stephen L. Coles, J. H. McGraw, J. H. Robertson and Charles E. Chapin.

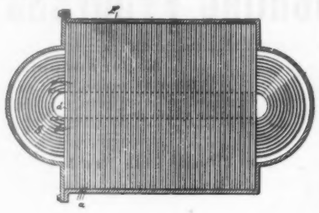
Non-resident members—L. S. Berg, San Antonio, Tex.; Charles A. Hamilton, Waterbury, Conn.; Charles T. Silsby, Seneca Falls, N. Y.; J. W. Marsh, Pittsburgh, Pa.; J. W. Welch, Hartford, Conn.; A. R. Morison, Willimantic, Conn.

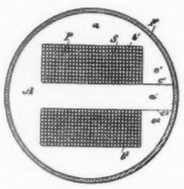
The Edison General Electric Company has entered into a contract with the Louisville Railway Company, of Louisville, Ky., for a large station equipment, including four No. 60 generators of 150,000 watts (200 horse-power) each. This road is now the property of the great street railway syndicate which is operating roads in Buffalo, Pittsburgh, Louisville, Newark, Rochester and elsewhere.

RECENT ELECTRICAL PATENTS.

IMPROVEMENT IN CONVERTERS.

George Westinghouse, Jr., has recently patented an improvement in converters, which may be understood from an inspection of the accompanying engraving. The idea of the invention is to produce a converter which may be conveniently placed inside of lamp-posts in the streets through which an alternating current system of distribution extends. The cores of the converters are built up of circular disks of sheet iron A, stamped with openings to contain

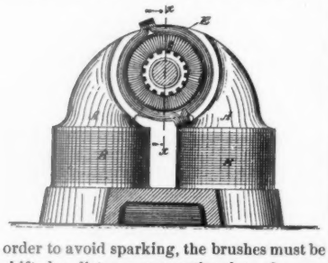




the primary and secondary windings P S. A tongue a' is formed of the central portion of the disk by cutting it through at one end so that the tongue may be bent away from the main portion of the disk. This is done in order that the iron disks may be applied to a pair of coils already wound. The edges e' e'' are bent back when the core is being built up by the superposed disks, and the tongues a' are inserted through the coils, the alternate disks having their tongues placed at opposite sides of the pile. The plates a a are covered with paper or some other non-magnetic substance on one side. After the core has been sufficiently built up, the entire converter is placed in a solid tube F of soft iron properly fitted thereto, and the whole inserted within the post in which it is to be contained.

A NEW DYNAMO ELECTRIC MACHINE.

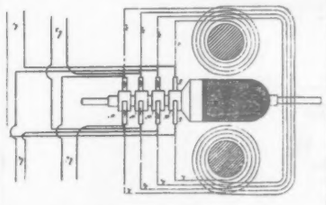
The accompanying engraving illustrates an improvement in dynamo electric machines recently patented by W. Stanley, Jr., of Great Barrington, Mass. The invention is applicable to any form of generator having a field of simple curvature, the design being to preserve the diameter of commutation on a fixed line and at the same time maintain a constant difference of potential between the terminals of the generator. In dynamos as ordinarily constructed the neutral line is shifted forward or distorted when the machine is developing current, so that in



order to avoid sparking, the brushes must be shifted a distance proportional to the current generated. Mr. Stanley's invention is designed to dispense with the shifting of the brushes. He accomplishes this result by joining the pole pieces of the field magnets of the generator by iron plates or bridges, thus completely surrounding the armature with iron. Around the bridges and parallel to the shaft of the armature is laid a coil or coils of wire which cross the bridges in a plane forming an angle with the diameter of commutation, and this coil is connected in series with the armature coils. The iron bridges will tend alone to completely short circuit the lines of force which should flow to the armature, but the coils E oppose the passage of the lines of force through the bridge pieces, tending to develop an opposite polarity, and the lines of force are thus shunted through the armature. The position of the coil E thus determines the direction of the lines of force which are compelled to pass through the armature, and a neutral field will be created in the plane in which the coil lies, the position of which will be constant, thus fixing the position of the diameter of commutation and obviating the necessity of moving the collecting brushes to correspond therewith.

DYNAMO TELEGRAPHY.

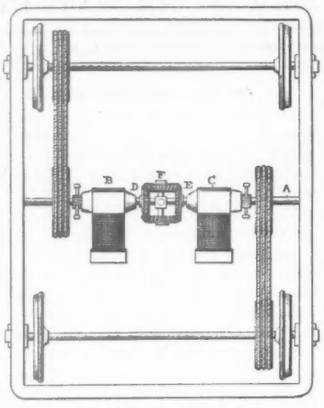
An important patent has recently been issued to the well-known electrical inventor, Stephen D. Field, for a dynamo electric machine especially adapted for telegraphic use in quadruplex and multiplex telegraph systems. It is the usual practice in using dynamos in telegraphy to have a separate series of generators for each polarity used in two or more circuits supplied from any single main station. Mr. Field constructs a single generator of a shunt wound character, having its armature composed of two or more independent windings, each complete winding connected with its own separate commutator and shaft and having its own collecting brushes, the field being composed of a number of shunt windings forming each a proportionate part of the total field, and each pair of brushes forming the terminals of one of the line circuits of the quadruplex or multiplex system supplied by the generator. The structure of the machine and arrangements of its circuits will be understood from the accompanying engraving, in which



the armature shaft is shown provided with a series of independent commutators a, each provided with its own brushes, connected with its own line and its own branch of the field magnet circuit. The armature is the well known drum type, and is divided off into as many spaces for windings as may be desirable for the special purposes in view and the special requirements of the service to which the machine is to be applied. Each of the commutators correspond, as to its number of bars, with the spaces. In each of the spaces on the armature are disposed as many separate windings as there are circuits to be supplied. In the form illustrated, four circuits and four complete windings are adopted. The windings are laid so that each will receive the same active inductive effect per revolution of the armature. This may be accomplished in practice by winding the respective coils corresponding to the several generating circuits on formers so that each will constitute a bunch or hank of the proper shape, and then laying these bunches on the armature in such manner that on one side of the armature the coils of one circuit will be nearest the pole pieces of the machine, while at the other side the same coils will have a position farthest from the pole pieces. The terminals of each of the coils are carried through the shaft, which is made hollow for the purpose, and brought to the respective bars of the commutators. It will thus be seen that four independent currents can be supplied by the one machine, the electromotive force and strength of current developed being dependent upon the character of the winding. The machine may be constructed originally to give different potential at each pair of brushes, and two or more of the circuits may be connected in multiple arc for the delivery of a heavier current into a circuit of lower resistance, whereas, if a great electromotive force should be desired in any particular circuit, two or more of the pairs of brushes may be connected in series. A machine of this character offers marked advantages in practice. By reason of the shunt character of the machine, the outside resistance ceases to be an annoying factor, and the mutual reaction of the armature and field magnet coils upon each other neutralize the baneful effects of extra currents in the line.

ELECTRIC LOCOMOTION.

In the accompanying engraving is illustrated a method, patented by Mr. Edison, of driving a street car or other vehicle, in which the direction of motion may be reversed or the speed varied within wide limits, without reversing the direction of motion of the driving electro-motor. Two motors are



employed, which are connected with the shaft to be driven by differential gearing. The armatures revolve in opposite directions, and carry on their adjoining ends two beveled gears, D E, which turn with the armatures, independent of the shaft A, and which engage with opposite sides of the epicyclic gear F, mounted upon a stud fixed to the shaft A between the armatures. In the field magnet circuit of each motor is placed an adjustable resistance for varying the strength of the field. If the two armatures are revolving in opposite directions with equal speed, it is evident that the epicyclic gear F will simply revolve on its journal, without being carried in the direction of either armature, or, in other words, without exerting any effort to revolve the shaft A. This condition of affairs exists when the field magnets of the two motors are of equal strength; and the car remains at rest. Should it be desired to start the car in motion, the resistance of the field magnet circuits will be varied so that the field of the motor B will be strengthened, and that of the motor C will be weakened. This will create a difference of speed in the two armatures, and the shaft A will be given a rotary speed equal to the difference in speed between the armatures. If it should be desired to reverse the direction of rotation of the shaft A, the field of the motor C would be increased, while that of B would be decreased in strength. Thus it will be seen that the vehicle may be reversed in direction, varied in speed, or brought to a stop, without stoppage or reversal of the driving motors. The epicyclic gearing permits of reduction in speed or multiplication of power of the motors, well adapting it for the purpose of street car propulsion, enabling the power to be increased or reduced to an unlimited extent in starting the car or in ascending and descending grades. It is claimed that the ability to reverse the direction of motion of the driven shaft without reversing the motors removes the difficulties heretofore encountered with commutator brushes upon car motors. The axle A is shown as an independent axle connected by belts with both axles of the car wheels, thus increasing the amount of traction, the central idea of the invention being the reversal in direction of motion of the driven shaft and its variation in speed of motion without reversal or stoppage of the driving motor. It is not, of course, limited in application to locomotion, but may equally well be applied to any kind of driven machinery wherein reversal of direction of motion is often required.

The Elmira Electric Railway.—Quick Work.

A remarkable feat of electrical railway construction has recently been completed in Elmira, N. Y. On the 30th of July the Elmira and Horseheads Railway Company placed a contract with the Edison General Electric Company for the equipment of 7,000 feet of track, six motor cars, and a full station equipment. At the same time a contract was placed with the John Stephenson Car Company for six new cars of solid and elegant construction. The contracts were made in both cases with the strong guarantee to the effect that the road should go into operation on the first day of September in order to accommodate the great Interstate Fair which was to be open on that day. A full history of the efforts made by both supply companies to fulfill the guarantee would be interesting reading, as it called for the quickest time ever made in electrical railway construction. Both the Edison Company and the Stephenson Company put their best men upon the work, and forwarded supplies with the utmost possible dispatch. On or about the 15th day of August the Stephenson Company informed the Sprague Company that its cars were ready for equipment, and at about the same time the motors were shipped from the Schenectady works of the Edison Company, which have a capacity of from 15 to 20 street car motors per day. The strike on the New York Central at this time did fair to cause very serious delays as the cars were to be shipped to New York. A special consultation of the Edison Company and the Stephenson Company was held at Schenectady, with the result of causing the motors to be shipped *via* the Delaware and Hudson Railroad and the Delaware, Lackawana and Western Railroad Companies, a round about route which necessitated special cars and unusual expedition. On about the 20th of August the completed cars began to go out from the Stephenson factory, two being shipped each day. In the meantime a contract had been placed with the Simplex Company of Boston for the feed wire, the Edison Company had forwarded all line material and supplies, and everything was on the ground but the poles, which were held in Northern New York awaiting arrival of cars which had been delayed on account of the New York Central strike. In this emergency every one turned in to help. Poles were gathered about Elmira, and at 12 o'clock on the night of August 23d, the street construction work commenced. Provision for the dynamos and appliances had been made by engaging a part of the Westinghouse station at Elmira.

On August 31st, notice was sent to the railway company that the road would commence operations on the following morning; and promptly at 6 A. M. on the first day of September, the road carried its first passengers. For the next few days the tests of the machinery were excessive, the cars frequently having to carry two loaded trailers, and to remain in service from early morning until late at night. The largest number of passengers carried by these electric cars with their complement of trail cars was a little over 25,000. The road was entirely satisfactory in every respect, and Col. Robinson and I. B. Newton & Company, the present owners of the road, have every reason to be grateful to the electrical companies concerned.

The Latest Returns.

In the September issue of *Whipple's Electric Reports* the following figures are given for central electric light stations.

Stations in United States	1,468
" Canada	103
" Cuba	1
" Mexico	9
Total Stations	1,596

GAS COMPANY RETURNS.

Companies in United States	968
" Canada	49
" Mexico	1
Total	1,018
Companies operating Electric Lights, U. S.	275
" " " " Canada	20
" " " " Mexico	1
Total	296

STREET RAILWAY FIGURES.

Companies in United States	857
" Canada	21
Total	878
Electric Roads in Operation and under Contract in United States	238
Electric Roads in Operation and under Contract in Canada	4
Total	242
Cable Roads in United States	44

The Zanesville, O., Street Railway has been bought by capitalists of Akron, O., for $65,000. The road will be rebuilt and equipped with electricity.

The Robinson Electric Radial Truck.

The inventor of the radial car truck system herewith described, is Mr. William Robinson, of Boston, Mass., who has been known long and favorably in railroad circles as the inventor of the Union switch and signal system of electric railway signals, now in use on all the leading railroads in the United States. Mr. Robinson formed the original company, called the "Union Electric Signal Company," to operate his electric signal invention. The controlling interest in the stock of that company was subsequently purchased by George Westinghouse, Jr., and his associates, who thereupon moved the works from Boston to Pittsburgh and changed the name of the company, giving it its present name the Union Switch and Signal Company. We are informed that the method used on electric railways, of connecting the rails together by means of wires, is Mr. Robinson's invention, he having used that as a part of his electric signal system, in which he used the rails of the track to conduct the electric currents.

A view of the truck alone is given in Fig. 1. It is one of Robinson's standard electric radial steel trucks under a closed car running in the regular electric service on the West End Railway, in Boston, since June 1, 1890. The dimensions of this car are as follows: Length over all, 36 feet four inches; length of body, 28 feet; wheel base, 15 feet; seating capacity, 42; carrying capacity, including standing room, about 150. The truck is equipped with two 15 horse-power Thomson-Houston electric motors carried on the axles.

The open radial car shown in Fig. 2 has 12 benches, seats 60 passengers, is 34 feet 3 inches long over all, 14 feet wheel base, provided with the Robinson radial standard steel truck and two 15 horse-power Thomson-Houston motors. This car has been running in the regular electric service on the West End Road, between Arlington and Bowdoin Square, since July 12th last, giving the utmost satisfaction to the public and the railway men.

In Fig. 3 is shown a closed car, which has the following dimensions: Length over all, 30 feet four inches; length of body, 22 feet; wheel base, 12 feet; seating capacity, 34.

Fourteen other closed cars with Robinson radial trucks are nearly completed for the West End Railway Company. One of the Robinson electric radial cars of new design, elegant finish and magnificent proportions, has recently been shipped to the Eckington and Soldiers' Home Railway Company, Washington, D. C. This is a closed car and will seat about 40 passengers. The interior is finished in rich mahogany with gold panels. On the inside it has a sweeping arched roof, similar to the design of the latest steam cars, and above this a monitor top, not seen from the inside. A number of ventilators in the ceiling communicate with the monitor top, and through it with the exterior air, giving excellent ventilation without any draft. Altogether, this car is the finest yet built by the Robinson Company. In addition to the above, the Robinson Company has well underway 25 additional trucks and cars for use in various parts of the country.

This truck has recently successfully passed through a series of tests for amount of power used, traction and derailment.

On the occasion of one of these tests, a gentleman present used his best endeavors to throw one of the radial trucks off the track by placing in front of the wheels obstructions consisting of blocks of oak wood. This he did repeatedly while the car was running at various rates of speed, both on straight lines and on curves, but in every instance each wheel in succession passed over the obstructions and dropped back in its place on the track. He then finally put the block on the track across a switch just as the car was entering the switch, with the same result, each wheel in succession passing over the obstruction and dropping in its place on the track. Every effort to derail the radial truck proved unavailing. This test seemed to prove conclusively that no ordinary obstruction can derail the radial truck. A prominent railway official who witnessed the test remarked: "You cannot throw that car off the track unless you put a house and barn in front of it."

The radial truck patents are owned by the Robinson Radial Car Truck Company, of 95 Milk street, Boston, Mass., which is the parent company. All inquiries and applications for radial trucks for street railway purposes should, however, be addressed to the Robinson Electric Truck and Supply Company, of 180 Summer street, Boston, Mass., this latter company being the construction company licensed by the parent company.

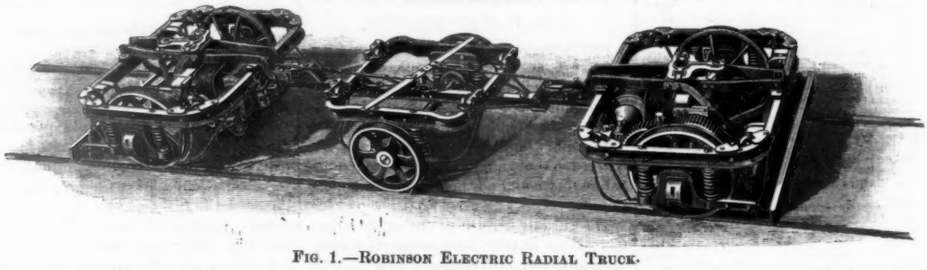


FIG. 1.—ROBINSON ELECTRIC RADIAL TRUCK.

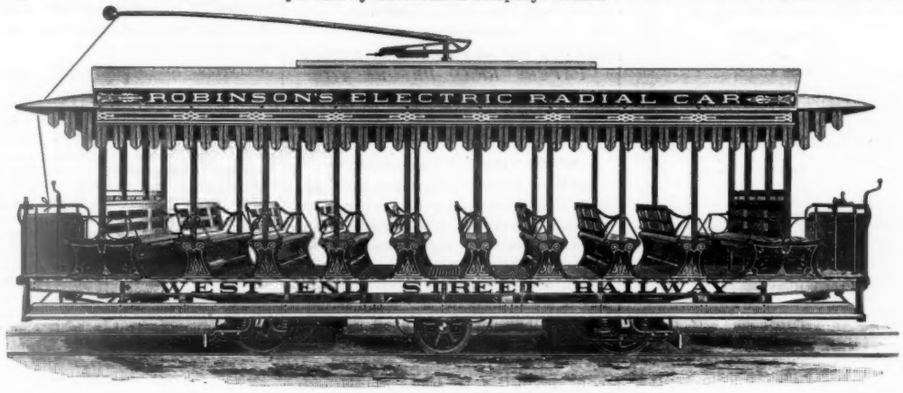


FIG. 2.—ROBINSON RADIAL OPEN ELECTRIC CAR.

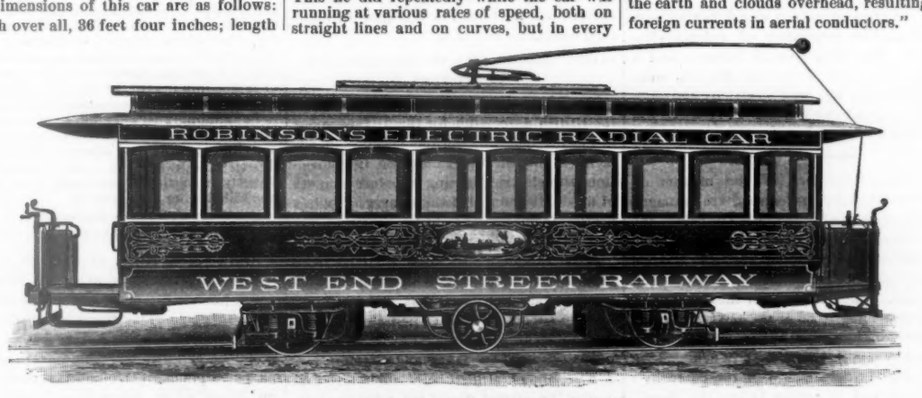


FIG. 3.—ROBINSON RADIAL CLOSED ELECTRIC CAR.

Foreign Noises on Telephone Wires.

During a recent discussion on foreign currents in overhead wires, Mr. W. H. Preece said: "I don't know how many of you there are who have amused yourselves by standing a whole night in a telegraph office, with telephones to your ears, observing and tracing the effects of these foreign currents. The sounds are sometimes most remarkable. Occasionally you hear a slight scream, not unlike a scream of pain from a child; at other times you hear a sound like the cry of a young bird in its nest; and every now and again there are heard other noises difficult to explain. One explanation given is that as the wires swing across the lines of force of the earth you have an electromotive force set up in these wires. Again there are sounds due to subtle atmospheric discharges which may be going on between currents in the earth and clouds overhead, resulting in foreign currents in aerial conductors."

In reference to Mr. Preece's remark that some of the currents might be due to the swinging of wires, Mr. Bennett stated that he had actually produced rhythmical deflections on a reflecting galvanometer by causing spans of wire running due East and West to be swung mechanically in calm weather.

Columbus, O.—The De Saut Electric Company has increased its capital stock from $50,000 to $100,000.

Joliet, Ill.—The Economy Light and Power Company; capital, $400,000.

Tacoma, Wash.—The Peninsular Electric Railway Company; capital, $500,000.

Chicago, Ill.—Consolidated Electric Company; to manufacture storage batteries; capital stock, $300,000; incorporators, Harry Lampert, Jr., B. L. Langworthy and E. J. Dahurs.

Ware, Mass.—Ware Electric Light Company; for furnishing light, heat and power in Ware and Hardwick; with a capital of $20,000, and F. D. Sitley as president and F. D. Gilmore, treasurer.

Chicago, Ill.—Northwest Chicago Electric Street Railway Company; to construct and maintain a street railway; capital stock, $200,000; incorporators, Wm. Boldenweck, Patrick K. Maginnis and Geo. Lill.

Chicago, Ill.—Dyer Light, Heat and Power Company, of Illinois, to do a general lighting, heating and power business; capital stock, $2,000,000; incorporators, Henry Pratt, James Farr and William W. Weaver.

Chicago, Ill.—Columbian Exhibition and Transit Company; to exhibit motors for street railway propulsion, establish street railway lines, etc.; capital stock, $100,000; incorporators, P. J. McMahon, E. V. Hitch and H. C. Caulkins.

Chicago, Ill.—Elliott Electric Company; to manufacture and operate all kinds of appliances relating to electric railways; capital stock, $100,000; incorporators, M. W. Elliott, Francis W. Parker and C. P. Chapman.

Chicago, Ill.—Great Western Electric Supply Company, Chicago; to manufacture and deal in electrical supplies; capital stock, $250,000; incorporators, Henry M. Wolf, Frederick G. O'Connell and A. A. Bliss.

Marion, Ind.—The Marion Gas, Electric Light, Power and Fuel Company has been organized, with a capital stock of $400,000. The company is composed of Wm. B. Dodds, George W. Steele, Otto B. Spencer and Emory V. Donaldson.

Baltimore, Md.—J. J. Husband, E. L. Morling, J. J. Meyer and others, have organized the Underground Electric Traction Company, with a capital stock of $100,000, to construct electric street railways, with rails, conductors and trucks underground.

Portland, Me.—The Electrical Forging Company; capital stock, $2,000,000; for the purpose of manufacturing and operating electrical apparatus. The officers are: President, Frank E. Peck, East Wareham, Mass.; treasurer, Fred. J. Hutchinson, Boston, Mass.

Houston, Tex.—The Houston City Electric Railway Company has filed an amendment to its charter, increasing the capital stock from $400,000 to $800,000. The officers are, E. A. Allen, president; C. D. Holmes, vice-president; H. F. McGregor, general manager; F. Mundey, superintendent.

Leavenworth, Kan.—The Leavenworth Electric Street Railway Company, to operate from Fort Leavenworth to the National Soldiers' Home. Directors: Shaw F. Neely, John Hannon and Robert Garret, of Leavenworth; Henry L. Newman, of St. Louis; Bernard B. Sunny, of Chicago; William B. Knight and Delbert J. Hoff, of Kansas City, Mo. The capital stock is $300,000.

Troy, N. Y.—The Catskill Illuminating and Power Company; to manufacture, deal in and use dynamos, lamps, motors and storage batteries, and generally to supply electricity for lights, power and other uses, to the inhabitants of Catskill and Greene Counties. The capital stock is $45,000, and the incorporators are, W. S. C. Wiley, Edwin Lampman, J. Atwater Cooke, A. M. Young, Fred. Werner, Jacob J. Werner and Stanley Vincent.

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The German telegraph administration has established a telegraph office in the Island of Heligoland. The special rates to which telegrams for this point were previously subject have been abandoned, and all messages will be charged at the same rate as for other parts of the German empire.

These crisp mornings we are having now are first-class generators of animal electricity. Man is a storage battery, and a walk down town in the morning will completely charge him with electricity and vitality for a good day's work. Try it, if you have not already.

A curious instance of the manner in which matters civico-electrical are managed in this city was afforded last Thursday, the inquest on the death of lineman Kopp and a meeting of the Board of Electrical Control having both been appointed to take place on that day. The hour set for the opening of the inquest was 10.30 A. M., and at that hour counsel for the United States Electric Light Company applied for an adjournment on the ground that several of the company's witnesses had to appear before the Board. The adjournment was granted by the Coroner, who was apparently ignorant that the hour for the meeting of the Board of Electrical Control was one o'clock P. M. When the Board did meet the Mayor immediately ordered an adjournment, as he desired to postpone action on the Kopp case until the verdict of the Coroner's jury was known. Consequently the Coroner adjourned to suit the Mayor and the Mayor adjourned to wait for the Coroner. Comment is superfluous.

That gallant advocate of the electric light and sincere believer in its safety and value, Mr. S. E. Barton, of Boston, makes a few remarks that all can read and understand in the REVIEW this week. The amount of misrepresentation that electricity has had to bear is a thing appalling, and yet its defamers are compelled to retire one by one, discomfitted and disgraced. Much praise to men of sense and progress like Mr. Barton.

ELECTRICAL THIEVES.

Four persons were arrested in Washington last week, it having been discovered that they had made elaborate preparations to steal telegraphic reports of sporting news, by tapping the wires of the Western Union Telegraph Company. The plot was discovered in time and the plotters were arrested before they could put their scheme in operation.

The curious feature of the affair is that there is no district law against the tapping of wires, and the prisoners can only be arraigned as suspicious characters on a charge of destruction of property. Such attempts at stealing telegraph messages in transit have become quite common of late, and that every State should not provide penalties for the ingenious offenders and strive to make "the punishment fit the crime" is somewhat of an anomaly. Surely it is quite as necessary to protect telegraph messages in their electrical or immaterial state as it is when they have materialized into written dispatches.

REVIEW OF SOME OF THE RECENT PAPERS READ BEFORE THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

SIZE OF WIRE FOR TRANSFORMERS.

Sir Wm. Thomson has shown mathematically that it is not desirable for conductive purposes to make the circuit wire too thick when alternating currents are used, and that the general impression that the thicker the conductor the greater the effective conductance is not an accurate one; whether this is due to an influence exerted upon part of the conductor such as is exerted upon neighboring independent conductors is, as yet, a matter of speculation, but seems probable. The effective ohmic resistance is largely increased if the conductor be too thick, and especially in coils consisting of several layers of wire superposed on each other around a flat cylindrical core. This disclosure is of value in the building of transformers, as it shows the importance of not using too thick a primary conductor. If the resistance is desired to be very low, the proper plan to pursue is to use several independent braided or insulated conductors placed side by side, so that the current will be forced to circulate through each conductor full-bore.

SAFETY AGAINST FIRE IN ELECTRIC LIGHTING SYSTEMS.

Mr. Wilson Hartnell read a paper before the British Association for the Advancement of Science, pointing out the need of amendments to the rules to be observed in connection with electric lighting to reduce chances of fire. He states that the danger of wires heating from the current by reason of the size of the conductor employed has been grossly exaggerated. The smallest wire used in electric lighting is the twin flexible wire composed of 23 strands, and be found by experiment that one such strand only was sufficient to light a 110-volt 16 candle power lamp requiring about .58 amperes. A wire should at least be of such size that double the current would not raise the temperature 150 degrees. The experiments indicated that there was not the remotest danger of fire with currents and wires ordinarily used. He favors the use of fusible cutouts to avoid dangers from momentary rushes of current due to short circuits. The dangers arising from loose contacts should be avoided by dispensing, as far as possible, with screwed joints, and where they must be used placing them in plain view. Wherever possible connections should be soldered. He regards naked wires in insulators the best of insulation, and looks upon vulcanized india-rubber with distrust, as after continued exposure to the air it cracks. The use of varnish on supporting casings is of a doubtful propriety; if the place be not damp it is useless; if it be damp then a wire that will stand damp should be used. He regards the use of non-inflammable paints as ridiculous, as there is not the remotest risk of fire in the casing if the work is properly done.

PREVENTING SULPHATE OF LEAD IN STORAGE BATTERIES.

W. J. S. Barber Starkey read an interesting paper before the British Association for the Advancement of Science on "Secondary Batteries." He recited his experience in dealing with sulphate of lead formed on the plates after long standing or use. This forms an insoluble coating on the plates under the active material, and is a very annoying incident of the use of secondary batteries. He found that the trouble from this source may be avoided by putting a small quantity of carbonate of soda (ordinary washing soda) in the cells while charging. The buckling of plates and disintegration of active material in batteries used for traction may be avoided by packing the plates in a solid though porous mass of plaster of paris mixed with sawdust (2½ parts of sawdust and one of plaster of paris) mixed dry and packed between the plates, the diluted acid to which a little carbonate of soda has been added being gently poured upon the mixture. He found that a set of such cells which were charged in November still retained the charge the following June.

QUALITIES OF STEEL FOR PERMANENT MAGNETS.

A series of careful tests of the magnetic moments of various kinds of steel are described by Prof. W. H. Preece in a paper read before the British Association for the Advancement of Science. Prof. Preece found a great difference in the magnetism which could be impressed upon various grades of steel. He secured specimens from various British and French establishments and tested them by means of a magnetometer after pieces of the same size had been as powerfully magnetized as was possible. Eleven specimens tested varied in their mean induction from a power of 186 to 2,540. The French steel was found to be the best, that of Marchal leading all others.

MICA WILL GO UP.

A feature of the McKinley tariff bill of interest to the electrical fraternity is the levy of a duty of 35 per cent. ad valorem on mica. The material is coming into liberal use as an insulating material in electrical apparatus, and the increase of one-third its present price which will naturally follow the duty will be felt by dynamo as well as stove manufacturers. It is difficult to see how such an impost can be of advantage to the general public, or in fact to any one except the owners of one or two mines in this country, who will be afforded a chance to grow rich at the expense of several important industries. Upon the question as to the propriety of taxing imports for the encouragement and protection of infant industries, there is much to be said on either side, but we cannot think of any substantial argument in support of a discrimination against several promising industries and in favor of a raw material dug directly from the ground and upon which no skilled labor is expended.

ALUMINIUM.

Prof. J. M. Hirsh, of Chicago, was reported a short time ago as having discovered a new process for making aluminium from common clay. The *Engineering and Mining Journal*, of this city, was a little skeptical, and printed communications from its correspondents which tended to show up Hirsh as an adventurer. The latest news from Chicago is that Prof. Hirsh is to put his process to the test in order to prove that he can do what he says he can. He claims to be able to separate the metal from common clay by putting the ore into an aqueous solution and passing an electric current through it. This has always been said to be impossible, and if Hirsh can do it, he has by far the cheapest process known. A Cleveland telegram was recently received in Chicago stating that the Cowles Smelting Company had reduced the price of aluminium to $1 a pound.

CORRESPONDENCE.

News from Chicago, St. Louis, Boston and London.

OUR BOSTON LETTER.

Mr. James R. Magee, the genial manager of the Thomson-Houston Electric Company's isolated department, has returned to his residence at Melrose, Mass., after a sojourn of several months at Clifton-by-the-Sea.

The American Circular Loom Company, of this city, has enlarged its manufacturing facilities and increased its working force recently, owing to the steadily increasing demand for its patent woven insulated wires.

The Schaefer Electric Manufacturing Company, Cambridgeport, Mass., the well-known makers of the Schaefer incandescent lamp, has just placed in the market a new and meritorious high-voltage series lamp, which is sure to meet with public favor and large sale.

Messrs. Kendall & Slade, of this city, are among the busiest of the wiring and construction firms in New England. Among their recent orders was one for wiring up the large furniture house of Messrs. Sawyer, Walbridge & Briggs, this city, for an isolated incandescent light plant. This firm recently wired for incandescent lights a church at Salem and Beverly, respectively.

The Eco Magneto Clock Company, this city, whose special type of Watchman's Electric Register is rendering such effective service wherever used, is enjoying a boom in its business, and the call for these reliable instruments is rapidly on the increase. Several of the clocks are being installed in the National Armory, Springfield, Mass.

The Wainwright Manufacturing Company, of Mass., continues to increase its business among the electric light stations of the country. Among its sales of recent date are the following: 100 horse-power heater to the Western Power and Construction Company, Chicago; 75 horse-power heater to the Westinghouse Electric Company, Pittsburgh, for part of the equipment of the latter company's new local plant at Ogden, Nebraska.

The New England Wiring and Construction Company, of this city, has been absorbed by the Edison General Electric Company, of New York; yet the principal officers of the former company will continue in the management of the business at the old offices, 38 Oliver street. Mr. Sidney B. Paine will be district manager; Mr. Wm. H. Francis, district auditor, and Mr. A. R. Bush, district engineer.

The Standard Electric Supply Company has been organized under the laws of the State of Maine, with a capital of $100,000; officers: William P. Fairbanks, of New York, president, and William C. Woodward, of Boston, treasurer. The company has already established itself in comfortable and nicely situated offices, with adjoining salesrooms, on the first floor of the New England building, Nos. 180–182 Summer street, this city. The offices are fitted up and occupied and the salesrooms fully stocked with the company's specialties, and everybody and everything identified with the new enterprise is in proper trim and ready for business. Among the specialties which will be handled by the Standard Electric Supply Company are: Kerite wires and tapes, solar carbons, carbon brushes and Hill switches. A general line of electrical supplies for railway lighting and power work will be kept constantly in stock. Messrs. W. E. Stow and E. O. Johnson will be connected with the company as sales agents.

Mr. C. L. Edgar, manager Edison Illuminating Company, this city, has returned from his Western trip.

Mr. Wm. E. Stow, for several years identified with electrical enterprises, has been appointed sales agent of the Standard Electric Supply Company, this city.

Mr. F. Montague Sowdon, well known in New England as a promotor of several successful electrical industries, has become the treasurer of the Ross & White Violin Company, this city.

Mr. Elliott O. Johnson, formerly connected with the Thomson-Houston Electric Company, and more recently engaged in business at Lynn, Mass., as an electrical contractor, has accepted a position with the Standard Electric Supply Company, this city.

The Robinson Electric Truck and Supply Company, of this city, has been formed as a sub-company of the Robinson Radial Car Truck Company, to operate under license for the construction of the latter company's car trucks for electric railway service.

Gethin's Gravity Battery is in demand. The New England Phonograph Company, this city, has adopted this battery to charge accumulators for operating phonographs. Col. Aug. N. Sampson, manager of the phonograph company, has given a magnificent testimonial to the battery named.

Mr. Charles E. Rowe, for many years connected with the electric supply business, has opened an office on his own account at Room 412, Shoe and Leather Exchange Building, Bedford and Kingston streets, this city. His specialties at present will be the Sanford electric protector and lightning arrester, and the Pumpelly storage battery, and he will also do general electric construction work.

The Eddy Electric Motor Company, through its general agent, Mr. M. E. Baird, has received a handsome order from the proprietors of the *Globe*, Toronto, Canada. This order calls for 11 motors of varying sizes to be used for running printing presses.

Natick Electric Railway.—The Selectmen of Natick, Mass., granted a franchise recently to the Natick Electric Street Railway Company, and the latter will build a road from Natick to South Natick. Work will probably be commenced at once, as the franchise requires that the road shall be completed by July 1, 1891. It is predicted that the Natick Company will extend its tracks through Wellesley and thence to Newton, where it will connect with the electric system of the latter town and Waltham, thus making a complete line between Natick and Boston.

The "Porte-Electric."—Very little has been published of late regarding this novel yet important enterprise. Successful experiments during the past month on the circular road-bed of the "Porte-Electric" Company at Harvard Station, Mass., gives indisputable evidence that the new system—as above named—is already an assured success. Last week several private exhibitions were successfully given, the rate of speed attained by the cars being five-eighths of a mile (the length of the road) in 1½ minutes. An exhibition will soon be given to which the public will be invited.

The Edison Illuminating Company, of this city, is busy enlarging its facilities for furnishing light and power. Both stations have been increased, recently, over 1,000 horse power, seven 150 horse power engines having been added to the company's service.

This sudden increase of business has necessitated the installation, for temporary use, of two boilers of 150 horse power each (horizontal tubular), furnished by the Jarvis Engineering Company. These boilers were placed in position and ready for steam within one week from the date order was given.

The Edison Illuminating Company is putting in a new feeder on Dover street up Shawmut avenue. The mains on Tremont street will also be extended from Dover street down. At present the company has no lines in South Boston, but to fulfill some of its contracts there a line will be erected to South Boston very soon. It will be laid through Congress street and under the draw of the bridge by a sub-marine cable. There will be three cables, each of 19 No. 10 Birmingham wire guage. The cables will be made by the Eastern Electric Cable Company, and will be armored and of special make.

This large demand for increased service is an additional evidence of the push and enterprise of the Edison Illuminating Company's general manager, Mr. C. L. Edgar.

Boston, Sept. 27, 1890. W. I. B.

OUR ST. LOUIS LETTER.

With the Exception of the Exposition, St. Louis has little to show in electrical news for the past month. Additional lights to the Municipal Electric Light Company's circuit, the resignation of Supervisor of City Lights Matlack, the completion of the carbon trust in St. Louis, and the recent addition to the Missouri Electric Light Company's plant, cover about all the field in St. Louis. Eight months ago, when the city decided to use the electric light for illuminating the streets, the need of a thorough electrical engineer, such as Mr. Matlack, was recognized. Not content with home talent, the Board of Public Improvements decided to appoint a Chicagoan to the position, and Mr. Matlack was chosen, but has now resigned.

The Chief Topic in Electrical Circles here is the electrical department of the St. Louis Exposition. Under the able management of Messrs. Frank Guilnnie and Fred H. Whipple, this feature has become more pronounced than in former years. Displays hailing from New York, Washington, Boston, Pittsburgh, Chicago and the West, are all to be found in the exhibition, while St. Louis manages to cover a good deal of territory with its electrical industries. The Southern Electrical Supply Company, the St. Louis Electrical Supply Company, the Parker-Russell Carbon Company, Union Electrical Construction Company, A. Seigel Gas Fixture Company, the Fay Gas Fixture Company, Blatner & Adams, Unicycle Electric Elevated Railway, Rose Electric Company, Shultz Belting Company, are all here with their displays, well worth the seeing. Perhaps the most striking displays are those of electroliers, which admit of such a variety of beautiful designs and blending of colors as to catch the eye at once. The supply companies, owing to their position and attractive displays, come in for no small amount of comment. The electric railway is always in demand, and very few people leave the building without having a ride. A novelty in the belting line is the exhibit of the Shultz Belting Company. Here several hands are at work making linked belting, which is thus seen in all stages of construction. The Parker-Russell Carbon Company carry off all the honors in the carbon line. The fact that hardly a lamp in the whole building is without their "sunlight" carbon is in itself a big display. A neat machine, for which a patent has been applied, is the "Ajax" snow plow, an invention of M. Wueple. Mr. Wueple is the mechanical engineer of the Bridge and Tunnel Company. He has designed this plow for the St. Louis and East St. Louis Electric Railway Company. It is both a plow and a track cleaner, and uses instead of salt chloride of calcium, which, being in liquid form, is easier distributed along the track.

St. Louis, Sept. 25. W. H. B.

OUR LONDON LETTER.

The General Electric Company, Limited.—At the general meeting of the company, held a few days since, a remarkably good report was given, the actual earnings of the company upon capital invested being more than 25 per cent. per annum. A dividend of 15 per cent. was declared on the preference shares and 7½ per cent. on the ordinary, besides carrying a considerable sum to reserve fund.

Fire at the Edison-Swan Company's Factory.—Last week a fire broke out in the depositing rooms of the Edison & Swan Company's factory at Ponder's End, and it was at first feared the whole of the premises would have been destroyed. It is stated that the cause of the fire was extra pressure by which an electric spark ignited some benzoline. All the girls employed were got out uninjured, and the damage confined to the room in which the fire originated. The company have large stocks on hand and will experience no difficulty in carrying out orders, but they ask their customers' forbearance for a few days in the orders for special lamps.

Woolwich Electric Lighting.—The local board have consented to the Woolwich District Electric Light Company lighting the town.

Messrs. Ernest Scott & Company.—This firm have secured the contract for a big installation for a Glasgow firm with a total plant consisting of dynamos equal to 1,200 sixteen candle-power lamps. They have also a contract for the entire lighting of the new offices and printing works of the *Bolton Evening News*, and as these are in addition to many smaller installations, it may be seen that the firm are extremely busy in electric work.

Paris.—An electric tramway is now being laid down between the Trocadero and the Place Rigalle, and there is no doubt will secure a large amount of patronage.

Berlin.—In Berlin and its suburbs all the railway stations are to be illuminated by the electric light. Buffalo Bill is now showing in this city, and Messrs. Erfurth and Seinell have, in under eight days, put down a large electric lighting plant. As the authorities do not allow high tension alternating currents for public shows, the Wild West Company had to leave their own removable plant at Paris, and to invite tenders for the lighting of their show, covering some 60,000 square yards, in conformity with the very severe German rules governing electric lighting. Messrs. Erfurth and Seinell undertook to do the work in eight days, and successfully carried it out in seven days, eight and a half hours. There are 150 arc lamps with reflectors of 1,500 candle-power each suspended from high posts, 50 glow lamps of 25 candle-power each and a search light projector of 45 amperes, together with 20,500 yards of wiring and cables and 1,500 insulators; a special machine had to be erected for four boilers of 25 horse-power each and four 200 volt dynamos. The whole plant runs to the greatest satisfaction, and is supposed to be the most rapid work carried out anywhere out of the United States.

North West German Industrial Exhibition, Bremen.—The electrical section of this exhibition, to which most of the best known German firms have sent exhibits, is stated to be very complete. The application of the Thomson-Houston system to traction work is shown for the first time in Germany on a street railway from the city to the exhibition. The electric lighting is in the hands of Messrs. Siemens and Halske, Schuckert & Company and the Hamburg Electric Company. CHARLES FFRENCH.

London, Sept. 20, 1890.

BOOK NOTICES.

"The National Electric Light Association, Kansas City Convention, 1890," Vol. VIII, has been received from Secretary Allen R. Foote. The volume is well gotten up and is in a durable form.

"Electricity in Warfare," by Lieut. Bradley A. Fiske, U. S. N., is a little pamphlet reprinted from the Journal of the Franklin Institute. The article has already appeared in the ELECTRICAL REVIEW.

OUR CHICAGO LETTER.

Among the electrical attractions of the Chicago Exposition is the varied display of fixtures, telegraph instruments and house goods by the Great Western Electric Supply Company. A sign made of cleats and another made of colored shades are novel, and like the elk-head electrolier which lights this exhibit are much admired. The assortment of linemen's tools shown also seems to catch the eye of the electrical people who visit the Exposition. The same firm also has a display of its specialties at the St. Louis Exhibition, in charge of Mr. G. T. Hewes.

An exciting base ball game was recently indulged in here. The opposing forces were called "Okonites" and "Kerites." The officers and employés of the Central Electric Company made up the former, while the latter was composed of corresponding individuals from the Western Electric Company. Here are the names:

"Okonites"—G. McKinlock, J. McKinlock, Sharp, Sanders, Postlewait, Furlong, Cushing, Gilbert, Stacey.

"Kerites"—Langan, Hurd, Carpenter, Parker, Gilbert, Joslyn, Huemmer, Jenness, Haeger.

It was a very democratic affair, the president of one company lining out a base hit to the office boy of the other company, and *vice versa*. Time was called at the end of the seventh inning, when it was discovered that the "Okonites" had beaten the "Kerites" to the tune 28 to 9. The umpire was anonymous, and it is said a collection is now being taken up by both firms to see that his resting place is kept verdant. There were a number of New York gentlemen present to witness the exciting contest, among them Mr. George T. Manson, who acted as mascot for the "Okonites."

The Electric Merchandise Company, 11 Adams street, Chicago, has recently been sending a neat circular to the trade, containing cuts and descriptions of its improved gears, pinions, bearings, etc. These are manufactured for all systems, and a large and varied stock is constantly on hand at the company's warerooms.

The Great Western Electric Supply Company in about 10 days will place a unique switch on the market embodying many new features. It is claimed that the switch works on an entirely new principle, and a sensation is promised in switch circles. The above company is also about to place a new fire alarm system on the market, which is said to possess many advantages over the releave key systems now in use, and will probably find special favor in small towns.

Reports from Cincinnati, Ohio, give account of the failure of the Novelty Electric Supply Manufacturing Company, of that city. The doors of the company were closed by the Sheriff on Tuesday, September 16.

A. H. Reese, special agent of the Edison General Electric Company, was a recent visitor in the city. Mr. Reese reports the following sales made during September: Standard Oil Company, Whiting, Ind., 1,000 lights; Diamond Match Company, St. Louis, 300; Woodward & Tiernan, St. Louis, 400 increase; St. Louis Brewing Association, St. Louis, 450; Crown Linseed Oil Company, St. Louis, 100; Anchor Oil Company, Helena, Ark., 100.

Wm. Hood, Western manager of the Accumulator Company, of New York, has removed his office from the Rookery Building to 239 La Salle street. In his new quarters Mr. Hood will be able to show the successful working of the storage battery, and will also carry a small stock.

S. S. Leonard, Western representative of the Hill Clutch Works, has closed a contract with the Kansas City Gas Light & Coke Company, for equipping their new electric light plant with Hill clutch pulleys. The plant will consist of 12 arc machines, power for which will be furnished by an Allis Corliss engine. The El Paso Electric Light Company, Colorado Springs, Colorado, will also be equipped with Hill pulleys.

At the last meeting of the World's Fair Commissioners an important step in the line of practical work was accomplished. It is proposed to do away with the intricacy of shafting and belting, so prominent in machinery displays, by using electric motors. The heavy machinery will be supplied with power from steam engines, while motors which occupy but little room will be used for the smaller machines.

It has been rumored recently that the Great Western Electric Supply Company was insolvent. This report, which was originated by unknown parties, caused the company considerable trouble, and many reports on their standing were asked for. The rumors were without foundation and false in every particular, as is plainly shown from the fact of the payment of all outstanding accounts in full to date, leaving the company's immense stock and fixtures free from debt. The financial standing of this company is A1 and has been since its organization. Reports to this effect can be had on application to the company.

Chicago, Sept. 27. D. B. D.

Telephonic News

⁂ Akron, O., is to have its telephone exchange improved.

⁂ The telephone company has just established an exchange at Van Buren, Ark.

⁂ Mr. Geo. Pulver, of Little Falls, N. Y., succeeds Mr. Paul T. Brady as manager of the central telephone office at Cooperstown.

⁂ The Minneapolis telephone exchange has moved into its new building where there is a switchboard with a capacity of 4,000 wires.

⁂ C. B. Hopkins, of telephone and electric companies in Washington and one of the World's Fair commissioners, reports favorable progress in building his company's lines in that State and Oregon.

⁂ Injunctions were entered in Philadelphia last week in favor of the Bell Telephone Company, enjoining Frank Tobin, W. F. Killan, John E. Morton and Borsch & Rommel, from using telephones containing infringements on the Bell patents.

⁂ The Philadelphia subscribers to the new telephone exchange are in receipt of a circular explaining that the poor service rendered to some of them for the past few weeks was due to the unauthorized cutting and interference with their wires by persons introducing an alleged electric protector.

⁂ General Manager Uline, of the Hudson River Telephone Company, Albany, is just now "up to his eyes" in business, superintending the many improvements being made to the telephone system and preparing the plans for still more important improvements to be made in the near future.

⁂ The Terre Haute, Ind., telephone exchange is going to rebuild its lines. Every old wire in the city will be replaced by a new one. The company has a force of about 15 men at work and the changes will cost in the neighborhood of $12,000. The work will require several months to complete.

⁂ Since the Ontario Telephone Company was organized in Peterboro, Ont., there have been rumors that the Bell Company would fight the new company, and last week the first move in the war was made when a circular was issued by Mr. H. W. Kent, local manager of the Bell Company, notifying that the rate of connection with his exchange would be reduced to $10 per annum until further notice.

⁂ The Chicago Bell Telephone Company is not worrying apparently over the prospect of a rival in the new company organized by the druggists. As yet the old concern has taken no official notice of the new company. Superintendent Wilson recently said: "Anybody can organize a telephone company, and we have always expected that a rival concern would bob up some time. I know nothing of the new company, and have no idea as to what action our people will take if the matter reaches an actual competitive contest."

News of the World's Fair.

One of the most important steps in the line of practical work for the Fair was accomplished by the Committee upon Electricity and Electrical Appliances, at Chicago, on September 24. Col. Gardiner C. Sims, of Rhode Island, was elected chairman, and Martin Ryan, of North Dakota, secretary. Both officers are practical men. They outlined a plan which, while it will meet with some opposition from many of the exhibitors, is favored by almost every commissioner. They propose to do away with the intricacy of shafting and belting, so prominent in machinery displays, by using electric motors.

An Electrical Opening.

Messrs. Alexander, Barney & Chapin, recently of the Sawyer-Man Electric Company, will formally open their new supply store at 20 Cortlandt street, in the Telephone Building, New York, Monday, October 6th. Electrical men generally are receiving a neat little circular, accompanied by a *menu* of the many good things which will grace the festive board on that occasion. The invitation is cordially extended to all.

The Tripp Electric Truck.

Probably no branch of business has advanced more rapidly during the past year than the manufacturing of electric trucks for street railway purposes, and the business is yet in its infancy. The Tripp Manufacturing Company, of Boston, were early in the field, and already their name is widely known. The business of the company has increased so rapidly that larger factory accommodations are required, and arrangements are soon to be consummated for doubling the capacity of their plant, thus insuring dispatch in the shipment of all orders.

The accompanying illustration represents the standard truck for 14, 16 or 18 feet cars. It is manufactured with or without extension springs, which are designed to prevent oscillation of the car body. For the largest car a top rail is required, and a bottom truss is used from end to end of the equalizing bar and bolted to it by four vertical supports. The equalizing bar is perfectly straight, which is a new departure. The boxes are bolted with steel pins through a lug on the box to the equalizing bar, making the removal of the body from the wheels extremely easy. By the removal of four bolts the wheels can be removed.

The Tripp trucks are equipped with Tripp's anti-friction journal bearings, saving a large amount of power, and are noteworthy for their simplicity as well as durability. The bearings are absolutely dust-proof, and after the most severe tests show no detrimental wear.

The following are some of the leading railways that are now using the Tripp trucks and bearings:

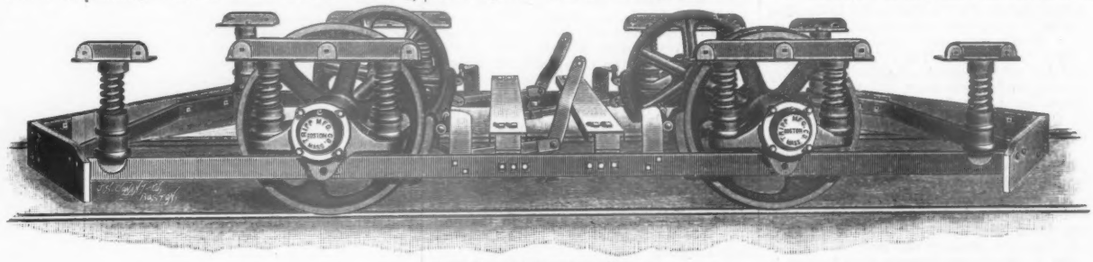
West End Street Railway, Boston, Mass.; Electro Dynamic Company, Philadelphia, Pa.; Beverly & Danvers Railroad, Beverly, Mass.; St. Louis Cable & Western Railroad, St. Louis, Mo.; Citizens' Railway Company, St. Louis, Mo.; Brooklyn Street Railroad Company, Cleveland, Ohio; Citizens' Traction Company, Pittsburgh, Pa.; Concord Horse Railroad, Concord, N. H.; Worcester Consolidated Street Railroad, Worcester, Mass.; Wilkes-Barre & Suburban Street Railroad, Wilkes-Barre, Pa.

The following roads have now contracted for the above trucks:

West Side Street Railroad, Milwaukee, Wis.; Citizens' Street Railway, Indianapolis, Ind.; St. Paul City Railroad, St. Paul, Minn.; Tacoma & Steilacoom Railroad, Tacoma, Washington; Vancouver Electric R. R. & Lighting Co., Vancouver, B. C.

Many other roads on the Pacific coast, and in other sections of the country have specified these trucks.

The company manufactures every variety of trucks for electric, cable or steam cars, and the rapid increase in its business seems to show that perfect satisfaction has been given.



THE TRIPP ELECTRIC TRUCK.

The Case of Shibuya Jugigo.

Attorney-General Tabor, on behalf of Warden Brush, of Sing Sing prison, has been served with notice to show cause before the United States Supreme Court at Washington, on October 14, why the decision of Judge Lacombe, of the United States Circuit Court, denying the petition of Shibuya Jugigo, who is in Sing Sing prison, awaiting execution by electricity, for a writ of *habeas corpus*, should not be corrected.

Notes of the Short Electric Railway Company.

The severe electrical storms which have swept the country during the past month have put to test the devices applied to electric cars and power stations to divert lightning and protect the electrical machinery. The Short Electric Railway Company have had reports from their various roads which show the entire efficiency of their lightning arrester. Thus far the company has not lost an armature. On the Oakland branch of the Pittsburgh Traction Company, car No. 1 was struck September 5, all the wires of the fuse box going at once. No damage whatever was done to the car or its apparatus, and the frightened people who had rushed into the rain from the supposed danger, were glad to get back into the car, which carried them on in safety.

On the White Line, Dayton, O., September 5, every car on the road except the one protected by a Short lightning arrester was burned out and disabled. The storm in Dayton was unusually severe, houses, telegraph and telephone poles being struck all over the city. The fuses in the car mentioned were blown six times, and even the lamp fuses were burned out, but the prompt action of the motor man in replacing the wire prevented any further harm, and as stated before night the car was the only one left on the road.

The two lines, White Line and Green Line of the South Covington and Cincinnati Street Railway Company, were put into successful operation on the 17th instant. The Short system was used throughout and the superior workmanship of the overhead construction has called out the most flattering comments from the press and observers. The eight miles of double track cover the most important streets of Covington, and when the bridge is crossed, will bring the people into close communication with Cincinnati, the company having a terminus on Fountain Square. The electrical equipment consists of 12 cars and eight trailers. The car bodies are of Stephenson make; Bemis and Stephenson trucks are used, each equipped with 15 horse-power motors. The power station, which, by the way, is a model of its kind, contains two Armington & Sims engines, of 150 horse-power each, return flue tubular boilers, Murphy stoker and three 60,000 watt generators.

The trial trip over the two lines was made without stop or delay of any kind and the regular service of the roads have begun.

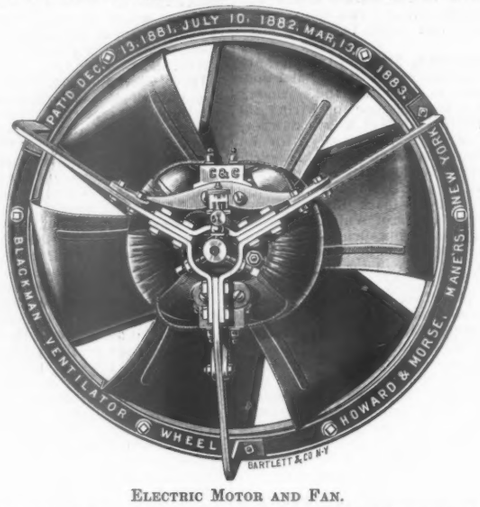
Two additions will be made to the main lines before Winter begins and Dayton and Newport, Ky., will be included in the system, making the road one of the strongest and most important in Southern Ohio.

Electric Motor in Combination with Ventilating Wheel.

The photograph from which the accompanying illustration is made, was taken from a plant the "C & C" Motor Company installed in the Union Trust Company building, on Broadway, made up of a 30-inch disk exhaust fan (Blackman) and electric motor mounted directly on the shaft and supported by the fan brackets. It revolves at a speed of 600 revolutions and delivers 20,000 cubic feet of air per minute.

The "C & C" Motor Company has found a very large demand for machines of this character on account of the noise and dirt which necessarily accompanies the use of a motor belted to a pulley on the fan.

Another advantage that it presents, particularly to electric light men and contractors, is the ease with which it may be installed and placed in any position, without regard to belting and shafting. Another requirement of a machine of this kind is compactness of form in order that the motor may obstruct the draught of air as little as possible. It is believed that this combination attains all these objects better than any other devices which have yet been applied to a similar purpose.



ELECTRIC MOTOR AND FAN.

The Development of the Slot Machine in Washington.

"Drop $10 in the slot and get out of jail in the morning." This is to be the direction on a new slot machine which has been devised by a benevolent and ingenious Washington man. These machines are to be placed in localities conveniently accessible to "the boys" as they start out for a night's lark. A card with the depositor's name, residence and any necessary particulars, and the requisite appropriations from his capital, enclosed in an envelope and dropped into the slot, will be taken out by an inspector very early in the morning. The depositor will then be immediately hunted up, relieved from any embarrassing detention, be given a bath and a good breakfast, and safely returned to his home. It is said that the projector will, for a reasonable consideration, furnish desirable evidence to show that his patrons were suddenly called out of town on business of importance, etc., etc. There is evidently large opportunity for the prosecution of this enterprise.

The new electric light company at Newport, Ky., is about to establish a district messenger system similar to the best now in operation at Cincinnati. It is also to be extended to Bellevue and Dayton. The wires will be stretched on the present electric poles. This is a novel side business for an electric light company.

The Citizens' Street Railway, Indianapolis, Ind.

Fig. 1 is a view of the Citizens' Street Railway, Indianapolis, Ind., which has been in operation since June 8th, 1890. It is one of the finest constructed electric railways in the country. The center pole double bracket construction has been used throughout and the poles are of heavy iron pipe, with fancy bracket and arm attached to each side of the pole, extending over the center of each track, supporting the trolley wire. This construction runs through the business portion of the city and is undoubtedly one of the finest overhead lines for railway work that has ever been built. On this line are a number of difficult curves which required considerable engineering skill to conform the overhead wire to the line of track. They are at present operating ten motor cars, equipped with two 15 horse-power motors, and each motor car at all times hauling a trail car.

FIG. 1.—VIEW OF THE ELECTRIC RAILWAY, INDIANAPOLIS, THOMSON-HOUSTON SYSTEM.

The traffic on this road since starting has been larger than the most sanguine had anticipated, and has been in operation without the slightest delay or trouble. The cars were manufactured by the St. Louis Car Company, of St. Louis, Mo. The power station is equipped with one 250 horse-power Wheelock engine, Corliss type, and one 500 horse-power Hazleton boiler, and natural gas is used instead of coal. Two 30 horse-power Thomson-Houston generators are installed in this station, together with an elegant marble switchboard, which has upon it circuit breakers, ampere meters, voltmeters, switches, rheostats and potential boards, and, taken altogether, is one of the finest stations which has been equipped in this country. The Thomson-Houston Electric Company is at present building one large electric snow sweeper for this railway, which will be used to remove the snow from their tracks during the Winter months.

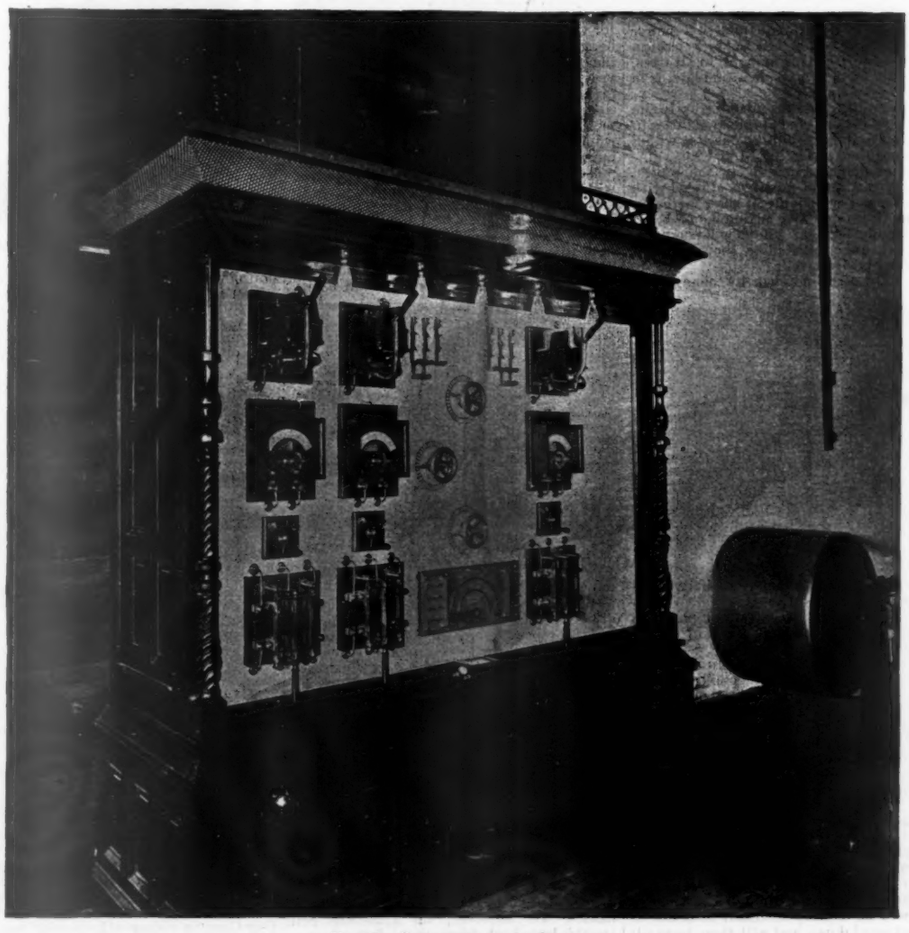


FIG. 2.—SWITCHBOARD OF SAME.

A company of St. Louis men has just been formed for the purpose of manufacturing and introducing a hydraulic street car motor. The pumps with which the hydraulic pressure is exerted are to be operated by electricity.

TELEGRAPHIC

.... The St. Joseph, Mo., office of the Western Union has just been repaired, at a cost of about $8,000.

.... The Western Union Telegraph Company will expend about $20,000 in repairing its building on Pine street, St. Louis.

.... The Postal Telegraph Cable Company is rapidly pushing its lines all over the South and is getting a good share of patronage.

.... Orders were given last week by President Fish, of the Illinois Central Railroad Company, for the construction of a new line of telegraph from Chicago to New Orleans.

.... Female clerks employed in the German postal telegraph service are from this time forward ordered to wear a uniform, which consists of a blue jersey, with orange collar and brass buttons.

.... The Postal Telegraph Company has its line from Port Townsend to Olympia, Wash., about half completed. The superintendent who has charge of the construction of the line, estimates that the line will be in operation in about two months.

.... W. J. Holmes has been appointed superintendent of telegraph of the Chicago and Erie Railway. He has for years held such a place on the Erie lines east of Buffalo, and a few months ago the New York, Pennsylvania and Ohio division was added to his territory.

.... The Court of Appeals at Montreal, Can., has maintained Judge Wurtele's judgment in the case of the Montreal Telegraph Company *vs.* the Great Northwestern Telegraph Company, in which he dismissed the plaintiffs' suit asking for a reduction of the lease from eight to six per cent.

.... Professor Marks, supervising engineer of the Philadelphia Edison Electric Light Company, is credited by the *Record* with saying: "I am willing to stake my reputation as an electrical engineer on my ability to construct an electric motor that could take a train from Philadelphia to New York in 36 minutes."

.... Three messenger boys in San Francisco have just been detected in a very neat scheme. After finding out the names of the arrivals at prominent hotels, they would compose telegrams and deliver them to the guests. The hotel clerk always paid the charges and the boys were on the road to wealth when their scheme was discovered.

.... The case of the Western Union Telegraph Company against the city of Grand Rapids, Mich., in which a preliminary injunction was granted restraining the city from removing the company's poles on Canal street, occupied the attention of Judge Severens in the United States Circuit Court, on September 19th. At the close of the arguments, along toward five o'clock, a colloquy occurred between Judge Severens and the attorneys on either side, from which it became apparent that the mind of the court was inclined to the position of the telegraph company and in favor of making the injunction a permanent one.

.... The present rate for a city telegraph message is 20 cents. It was 15 cents in 1886, and up to October, 1887. Competition made that rate. Persons who have noticed the gradual disappearance of postal telegraph city offices, and their steady absorption by the nearest Western Union stations, will not be surprised at the current rumor that the local rate is soon to be raised to 25 cents. Advocates of government control of telegraphs, railroads and other public service, say that five cents per message would cover the cost. An increase to 25 cents will furnish them another strong argument in favor of their plan.—*New York Press.*

* * Twenty members of the Trenton, N. J., city council, headed by President Geo. R. Whittaker, visited Atlantic City last week to inspect the electric street car system there.

* * The Cincinnati Southern Railroad reports that its business is greatly increased since the electric cars began to meet all trains at the depot. It has almost demoralized the bus business.—*Lexington, Ky., Leader.*

* * One of the huge engines at the Minneapolis electric railway power house is almost ready for operation. It was tested last week and gave satisfaction, and will furnish the power in a few days for the running of the cars, as soon as some remaining machinery arrives. The engine just placed is one of the most approved make, being a triple expansion condensing engine, of 12,000 horse-power. It has three cylinders, 24, 40 and 56 inches in diameter, respectively, each with a 60-inch stroke. The fly wheel is 28 feet in diameter and 73 inches across the face, weighing 45 tons, the whole weighing 200,000 pounds. It was manufactured by Ed. G. Allis, of Milwaukee. Two more exactly the same size will be placed in the power house, the foundation for one being already prepared.

On the New Standard Edison Electrolytic Meter.

BY A. E. KENNELLY.—A PAPER READ BEFORE THE ASSOCIATION OF EDISON ILLUMINATING COMPANIES, AT MINNEAPOLIS, SEPTEMBER 17, 1890.

Since the last meeting of the association, the new and improved pattern of the Edison meter has been decided upon, received Mr. Edison's approval, and has been completed by the Edison General Electric Company. It has already been introduced into two stations, Brooklyn and Winnipeg, and the reports upon its behavior in each case are excellent.

There are four standard sizes of these three-wire meters, Nos. 1, 2, 4 and 8; designed to supply 40, 80, 160 and 320 lamps, respectively. Meters of larger capacity than these are made specially. In all sizes, however, the bottles and plates are alike and of the pattern shown, the spools are alike, making the resistance of the bottle circuit the same in every meter, and the drop of potential in the shunt at full load is the same, namely, four-tenths of a volt.

It is arranged that in the smallest, or No. 1 meter, each milligramme of weight transferred represents one ampere hour of supply, and the transfer is 10 milligrammes per hour on full load. Similarly every meter transfers 10 milligrammes per hour at full load, so that each milligramme or transfer in a No. 8 meter represents eight ampere hours, and in No. 4 meter four ampere hours, the number of the meter being the index of the supply in each case.

This greatly simplifies the system, reduces the weight of bottles that have to be daily transported, reduces the stock that the station has to keep in hand, makes only one balance requisite instead of two, and with reasonable care the use of a separate multiplier for each size of meter is not found to be an inconvenience. The objection has been urged against the system that there is danger in making one milligramme of transfer stand for so large a unit as eight ampere hours in the No. 8 meter, since an error in weighing or in the proportions of the meter would result in an error in the bill eight times as great as the same discrepancies would produce in a No. 1 meter. Even granting the validity of the objection, however, it is evident that since meters are introduced in the capacity proportionate to their duty, the error in the No. 8 meter bill will only bear the same ratio to the whole amount charged, that the smaller No. 1 error bears to the bill. As a matter of experiment, however, taking for instance a series of tests made with the meters by Mr. R. S. White, at Brooklyn, the records of a set of Nos. 1, 2, 4 and 8 meters worked in series and at intervals for a week, on half load for the smallest, or five amperes, one-sixteenth of the load for the largest, showed practically the same result, the No. 8 meter underindicating about two per cent.

This high degree of relative accuracy, setting aside all question of care and skill, is secured by three things. The first is a higher degree of absolute accuracy in general. The old pattern meter is universally admitted to be a faithful and accurate instrument, but the intrinsic accuracy of the new pattern is about three times as great. The only chance for error in the operation of the electrolytic meter, accidents aside, is the variation of resistance in the bottle, whereby the true ratio between the currents in the bottle and shunt circuits is upset. The extent of such a disturbance, of course, depends upon the relative proportions of resistance in bottle and spool. Suppose it were possible for the new bottle to even double its resistance and to become five ohms instead of 2.5 at normal temperature. In circuit with a spool of 46½ ohms, such a change would only upset the balance and make the record in defect five per cent. In the old pattern meter, the doubling of the bottle resistance, were such a variation to be

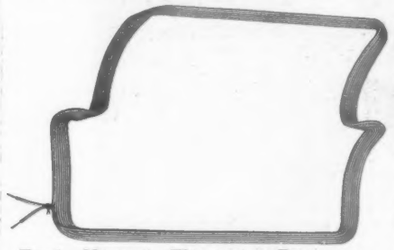


FIG. 1.—METHOD OF WINDING THE EICKEMEYER ARMATURE.

expected, would make the reading 15 per cent. in defect.

The second preventive of error in the largest sizes is due to the uniformity in the size of plate. A cause of discrepancy has always existed in a slight gain of the plates in weight independently of the current's action and due to their oxidation superficially. With care this source of error has always been minimized, but with the old meters it increased with the size of the meter since a larger plate offered a larger surface to oxidization. In the new pattern it is, of course, a fixed amount in all sizes, and owing to the small area of plate, is in any case very small.

The third precaution against error in the larger sizes is the use of duplicate bottles in the Nos. 4 and 8, as mutual checks, which are not required in the Nos. 1 and 2.

Another improvement is in the plates. These are castings of pure zinc alloyed with two per cent. (by weight) of pure mercury. This amalgam has the advantage of being more readily brought into good condition for use than the rolled plate; the trouble of varnishing is also saved.

The only other noteworthy change has been in the solution, which is about twice as dense as in the old bottles.

Mr. Edison has recently completed a mechanical meter on the pattern of one of his early patents in that direction. This instrument is a small motor, delicately constructed. The armature commences to rotate as soon as one lamp in the supplied circuit is turned on. The rotation accelerates as more lamps are lit, until at the full load of 20 lamps, the speed is 600 revolutions per minute. A counter worked from the armature shaft records the number of rotations, and, on duly proportioned dials, the supply. The field magnets are kept charged by a feeble current from the mains, while the main current passes through a shunt as in the electrolytic meter, and from the shunt terminal wires pass to the armature. The drop of potential in the shunt at full load is 1.5 volts. The model, though complete in itself, will be slightly modified in detail to suit commercial use, and will then be available for such cases where a mechanical meter is desirable. Mr. Edison does not consider that a mechanical meter can possibly be as cheap or as reliable as the electrolytic meter, firstly, owing to the necessary frictional error, which makes the record too low for very light loads and low speeds, and secondly, owing to the mechanical wear and tear of the working parts, which will need attention and change from time to time; but there are cases in which a direct reading mechanical meter will be an advantage, and he expects that from the tests and behavior of this model it will serve the purposes.

CONCLUSIONS DRAWN FROM ONE YEAR'S EXPERIENCE WITH THE STANDARD EDISON METER.—BY R. S. WHITE.

During the year's work with the new standard meter, we have taken 4,088 incandescent, 853 arc light and 244 motor readings, a total of 5,185, and have obtained uniformly good results. In a large number of cases, customers have kept tally of lamp hours, and in every instance expressed themselves as satisfied. A considerable number of tests have shown marked accuracy. The greater dispatch and care with which the motor work can be performed has been abundantly shown. The use of small and uniform plates secure, by the balance method, doubled accuracy in weighing and the elimination of the oxidation error. In brief, our experience with the standard meter shows improved ease and economy in operation with more uniform and accurate results. In so far as a chemical meter "fills the bill," little remains to be said.

It may be interesting to note the use of four Aron meters on our circuit for the past year. The frank, open countenances of these meters have won the favor of the meter man and the confidence of the customer. It is suspected also that the company would accept their advances with better grace were it not for their haughty treatment of the financial question involved.

We may conclude, then, that it is in the line of a direct reading dial meter that we are to look for the next advance in the commercial treatment of the meter question.

The Edison-Eickemeyer Street Railway Armature.

One of the most interesting and striking advances in railway motor construction which has recently been made is announced this week by the Edison General Electric Company, which has secured the use, for its railway system, of the Eickemeyer patents for winding armatures. It will be remembered that the Eickemeyer dynamo for lighting purposes was brought out about two years ago and created much discussion and favorable comment by the press. Since that time it has been actively exploited, and it is said that not a single dynamo armature wound upon the Eickemeyer plan has ever burned out. The Edison Company have made a thorough estimation of this winding with a view to adopting it for its railway motors, where it will undoubtedly be particularly valuable.

The Eickemeyer system of winding is radically different from the well-known Siemens. Each armature coil is wound upon a form of peculiar construction, and comes out standard and interchangeable in every respect, as shown in Fig 1. In building an armature originally, the laminated iron core is first prepared as in the Siemens armature and upon this are loosely placed the necessary number of standard coils, which are locked in place around the armature by means of the wooden pegs, shown in Fig. 2. The result is a square end, both front and rear, instead of the core shaped end of the Siemens armature. The coils are held firmly in place with absolutely no chance of motion, and there is no mechanical pressure from coil to coil which would tend to cause short circuit. The armatures are necessarily of standard diameter and interchangeable, and it is believed that the Eickemeyer armature will never burn out except from dead over load causing melting of the wire, from accidental mechanical injuries, or from short circuit due to outside causes. If, however, an armature coil should burn out from any of the causes mentioned, it could be replaced without difficulty by any ordinary mechanic, and without return to the factory, the whole operation consuming but a short time and a small amount of material. The railway company could be provided with a sufficient number of standard coils held in reserve.

FIG. 2.—VIEW OF ARMATURE.

From the illustration—Fig. 2—the peculiar curvature of the coils at the rear is easily seen; the same curvature is found at the front end. The whole armature is perfectly ventilated, particularly at the front, where difficulty has frequently occurred.

It is the strong belief of the Edison company that one of the most serious difficulties that has been met with in electric railway work is entirely overcome by the new armature, which they are now prepared to offer to their patrons.

The Hill Switches.

Mr. Warren S. Hill, of Boston, has recently equipped a number of plants with the switches illustrated herewith. A double pole switch on a slate base is shown in Fig. 1. It is solidly built, and made upon a novel plan that secures good electrical contact, with simple and effective mechanical operation. When the switch is closed, the

FIG. 1.—HILL'S DOUBLE POLE SWITCH.

contact brushes are pressed firmly between the wedge-shaped surfaces, and locked in this position. When it is desired to break the circuit, the break is quick and perfect, as all the parts separate at the same instant, giving the smallest possible amount of spark. It is made in different sizes, for currents of from 10 to 400 amperes. It is also made with the addition of a fusible metal cut-out, thus giving a double pole switch and

FIG. 2.—HILL'S DOUBLE POLE CONVERTER SWITCH.

double pole safety cut-out in one instrument.

In Fig. 2 is illustrated a double pole converter switch, by the use of which the converter can be completely cut off from the primary circuit, thereby avoiding all possibility of danger while working on the converter or on the secondary circuit. The mechanism is encased in an iron box with glass front; insulated openings are provided for the four wires, and a handle outside the box provides a means for operating the switch, as shown. The converter switch is made in capacities of 20, 40 and 80 amperes.

PERSONAL.

Mr. Paul T. Brady, of Cooperstown, N. Y., where he was actively identified with telephone work, has accepted a position with the Thomson-Houston Electric Company, and will make his headquarters at Syracuse.

Mr. Emil Guilleaume and Mr. M. T. Guilleaume, of Felten & Guilleaume, Mülheim-on-the-Rhine, are visiting in this country, making their headquarters with Messrs. J. H. Bunnell & Company, of this city, who are the representatives in this country of Felten & Guilleaume, extensive manufacturers of wires and cables of all descriptions. Our German visitors take a great interest in the wonderful development to be seen in the electrical field over here.

The New England Telegraph and Telephone Company is considering the feasibility of replacing its cedar poles with those made of iron or steel.

The Westinghouse Exhibit at the Pittsburgh Exposition.

This exposition is an annual attraction, arranged for the purpose of putting on public exhibition an array of specimens from the industrial productions for which Pittsburgh and Western Pennsylvania have become famous at home and abroad.

That electricity, of course, should be well represented will seem quite natural to everybody who has been watching the progress which has been made in that industry during the last few years by a corporation the home of which is in Pittsburgh. This is the Westinghouse Electric and Manufacturing Company, the management of which is well known among the electrical fraternity for its great enterprise and executive ability.

In order to obtain any idea of the grandeur of that company's display, it is necessary to make a personal inspection of the many details of electrical and mechanical construction represented here. The electrical exhibition of the Westinghouse Electric and Manufacturing Company is distinctively unique in the electrical industry of to-day.

As the pioneer and chief promoter of the alternating current system of electric lighting, the company confines itself simply to a display of alternating current apparatus and the display is so manifold and so complete in its illustration of the development of the alternating current system as to attract the attention of all visitors.

On entering what is known as Mechanical Hall of the exposition building, the display of the Westinghouse Company occupies the entire view on the right hand side, and one of the first pieces of machinery is a 3,000-light alternating current dynamo, belted to a rotary engine of 400 horse-power. The latter was designed and invented by Mr. George Westinghouse, Jr., and its peculiar shape and appearance for a steam engine attracts great attention. Next to that is another of 1,500 lights capacity, belted to a Westinghouse compound engine. Then follow, all in a row, a 750-light dynamo belted to a Westinghouse, Jr., engine of 60 horse-power; a 2,00 -volt, self-exciting machine of 1,000 incandescent lights, also belted to a Westinghouse, Jr., engine; a 25-light alternating current arc machine attached to a Westinghouse standard engine, and at last a 30 horse-power alternating current motor generator, also belted to a Westinghouse standard engine.

In the evening, all apparatus and the engine are in operation. The incandescent machine generates the power for all the lights used in and about the building. The 3,000-light dynamo, however, is operated exclusively to light up an illuminating sign which is put up in the form of an immense arch on the grounds surrounding the exposition. This arch carries the following lettering on both sides: "Westinghouse—Pioneers of the Alternating System." The two signs contain over 2,000 incandescent lamps of 16 candle-power each, and their effect in the evening gives a very good idea of the artistic capabilities of electric light illumination.

The other light machines operate the lights throughout the buildings as well as those utilized in the display. The arc dynamo operates the well-known flat carbon lamps, of which the Westinghouse Electric Manufacturing Company is the inventor.

The alternating current motor generator operates about a dozen Tesla and other alternating current motors, and if any one is desirous of having proof of the commercial usefulness of the Tesla motor, he can have it in this exhibition. For light manufacturing purposes especially, it is stated that there is no motor superior to the Tesla. In this display one motor operates a small printing press, several of them operate fans, while in one part of the exhibition another runs a carpet loom; again, another a stone crusher, a third rotates a six-foot circular saw, a fourth the Hercules mining machine, a fifth operates a soap wrapping machine and a caramel wrapping machine of the Nuttall Manufacturing Company,

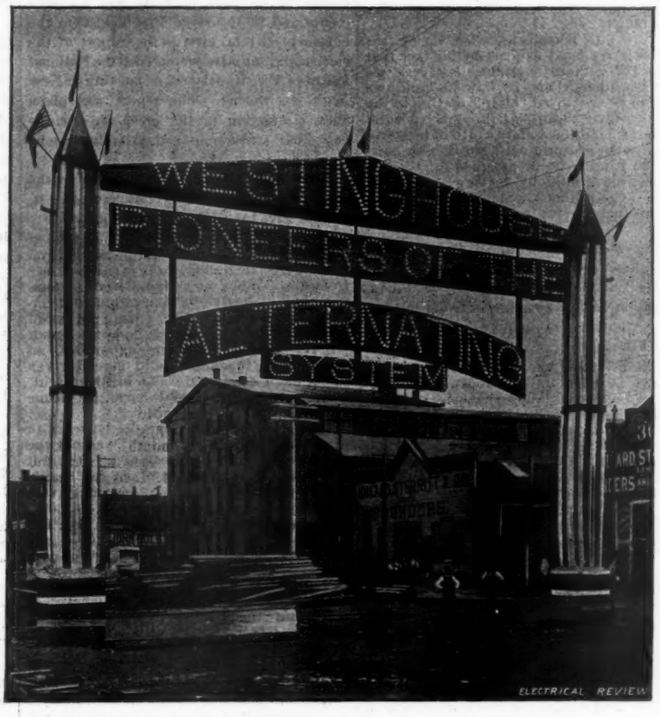


FIG. 3.—VIEW OF ELECTRIC LIGHT ARCH AT PITTSBURGH EXPOSITION.

Adjoining the motor generator is a pavilion handsomely furnished in antique oak, decorated with tropical plants and draped in the most elegant and tasteful manner. In a corner of this pavilion stands a Domestic sewing machine fitted up with a new type of alternating current motor brought out not long ago by the Westinghouse Company. The peculiarity of this motor is that its brushes are utilized as a regulator of the speed of the motor. This method of regulation is operated by the treadle of the sewing machine, the harder the treadle being pressed, the lower will be the speed. The working of the apparatus is constantly explained to the many interested housewives who are crowding around the pavilion all day long.

In the front of the pavilion stands an experimenting table filled with all kinds of peculiar contrivances of the alternating system. There is the Shallenberger meter, the converter, a stage regulator and a number of motors, the smallest one having only sufficient power to blow out a match. An electrician of the company is constantly in attendance for the purpose of illustrating the workings of the different appliances. He shows the action of the meter when attached to one lamp, 10 lamps, up to 50 lamps. He explains the street converter system. He shows the manner in which the stage regulator operates. The latter is connected with five switches, each controlling 10 lamps.

Altogether the display is one of the most interesting that has ever been gotten up for any exhibition.

It has not only been the object of the company to prove to the visitors that Pittsburgh stands to-day in the front rank in the electrical industry of the word, but the company is also anxious to explain, to everybody who cares to learn, the intricacies and wonders which are constantly confronting the uninitiated in electrical science.

We present several views of the exhibit above.

The ventilator fans exhibited by this company attract much attention, as do the many other electrical devices and appliances, all of which are artistically arranged. The Southern has just taken the agency of the well-known annunciators of the Novelty Electric Company, of Philadelphia. The sale of Candee wire by the Southern Company has far exceeded expectations, and orders are still coming in at a lively rate.

FIG. 1.—VIEW OF SECTION OF THE WESTINGHOUSE EXHIBIT AT THE PITTSBURGH EXPOSITION.

FIG. 2.—VIEW OF LARGE DYNAMOS AND SWITCHBOARDS OF WESTINGHOUSE EXHIBIT AT PITTSBURGH EXPOSITION.

ELECTRIC LIGHT NEWS

—— Carberry, Manitoba, is now expecting to be lighted with electricity shortly.

—— The Momence, Ill., Hay Palace will be lighted day and night by electric lights.

—— The August sales of Westinghouse Electric Company are said to have been $400,000.

—— One of the local papers in Minneapolis designated the attendants at the recent Edison Convention "electro-magnates."

—— The Luray Caverns are to be lighted by a system of white and colored incandescent electric lights that will add much to the beauty of that subterranean wonder.

—— "When the electric light on the corner of Gilmer and Palmetto streets fails to burn, the thieves in that neighborhood get in their work."—*Chattanooga, Tenn., News.*

—— Not less than seven ordinances for electric light and gas franchises are pending in Chicago. They include, in every instance, the entire territory within the city limits.

—— The Southwestern Michigan Fair Association have commenced the erection of arc electric lights around their track at Three Rivers, and will have racing by electricity.

—— An interesting use of electricity is that made by an insurance company of Philadelphia in illuminating a clock. The face is left in darkness, but the incandescent light shines through the numerals and makes lines of fire of the hands.

—— The Dayton Manufacturing Company is erecting an addition to its works at Dayton, O. The new building will be used for the manufacture of electric lighting apparatus for passenger coaches, and when completed the company will give employment to about 50 men in addition to those now in its service.

—— The Southern Electrical Supply Company has a very attractive exhibit in the St. Louis Exposition, occupying a conspicuous space in the electrical department.

Several False Statements Concerning Electric Fires Refuted.

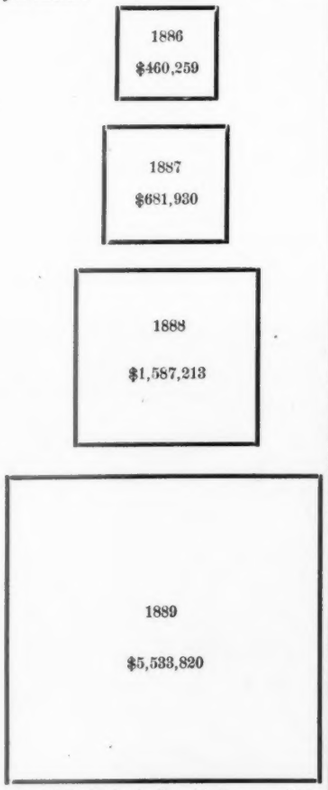
To the Editor of Electrical Review:

Nothing demonstrates so demonstratingly convincing as an object lesson, when comparative results are to be shown; therefore, one should be very careful in displaying objects to demonstrate results unless what they desire to teach is a fact beyond doubt.

If there are explanations to be made, and where "ifs" enter into the calculations, such explanations and ifs should precede the display of the object lesson, or accompany it in such a conspicuous way, that no one would look upon the object lesson without having the *whole* case before them. Otherwise, the eyes of the multitude take in the object lesson at a glance, because it only requires a look, and the mind swallows it as a fact. It goes from mouth to ear, and is spread in all directions as far and wide as man is interested in the subject.

If nothing but truth is taught, it can do no harm. Truth brightens and enlightens everybody, and makes the world better. If something that isn't truth is taught, somebody, or some particular interest, is injured, and a falsehood is given currency that will last until the electric light of truth finally dispels it. But the harm is done, and the world has to unlearn, at the cost of time, and to the detriment, perhaps, of thousands, what it had learned by one false, deceptive lesson.

The "Chronicle Fire Tables" (which is a book issued yearly by the Chronicle Company, Limited, of New York, an insurance publishing concern), in its 1890 edition, giving statistics designed to show the comparative danger of loss by fire from the various causes from year to year, displays upon a great white page in the front of the book the following legend in the form of an object lesson:



(Copyright 1890, by the Chronicle Company, Ld.)

"DIAGRAM SHOWING PROPERTY LOSSES BY FIRES FROM ELECTRIC WIRES AND LIGHTS."

Not a word of explanation appears in connection with these squares, which are purposely made more impressive by being highly colored, alternately yellow and red.

If one chooses to delve long enough in the labyrinth of words and figures in the book, he can find such information as the following, which I have extracted from its pages, and which should have deterred its publishers from painting such a picture of misrepresentation as a frontispiece.

"Owing to the incompleteness of the reports, the study of fire causes is very unsatisfactory. No particular effort is made by the public authorities to ascertain the actual causes of fires, taking the country as a whole. *In some of the larger cities there are municipal officers whose duty it is to investigate the origins of fires, but their labors, however conscientiously performed, contribute very little toward the enlightenment of the people with regard to the causes of fires in the country at large.* Even the officers of fire insurance companies, and of fire underwriters' organizations, are sometimes very reluctant to assign causes for fires which come under their notice.

"How little is really known of the origins of fires is rendered evident by the fact that of the 123 millions consumed last year, we have but a partial idea of how 79.7 millions came to be destroyed, after counting in the great loss (over 50 millions) through exposure. Of the 72.7 million dollars worth of property destroyed by fires originating on the premises, specific causes can be assigned for the loss of only 29.4 millions, leaving a property value of 43.3 millions, which was swept away by fires that started in some *unknown* manner."

The italics are mine, and I make them to show how very little reliance the "Fire Tables" artist himself attaches to the information from which he drew his inspiration, and which he displays as unquestionable fact.

"The principal known causes of fires are as follows, in order of rank: Incendiarism, defective flues, sparks (miscellaneous and locomotive), matches, lamp explosions, stoves, spontaneous combustion, lightning, lamp and lantern accidents, gas jets, forest and prairie fires. These eleven causes were responsible for 6,223 fires, or 73 per cent. of the whole number of fires of known origins. The remaining 2,267 fires of known origins were divided among 47 lesser causes.

* * * * * * *

"At this moment there are no causes of fires which are being more closely studied than electric wires and lights. Within four years, as shown by the colored diagram at the beginning of this volume, the value of the property annually destroyed by electric wires and lights has risen from less than one-half million dollars to more than five and one-half million dollars. *During the year* 1889 *electric wires were charged with their first great conflagration*, viz, the Kingston street fire, in Boston, Mass., on November 28, 1889.*

"The appended table shows how fires from this cause have increased in number and destructiveness in the last four years:

TABLE SHOWING RISKS BURNED AND PROPERTY LOSSES BY FIRES FROM ELECTRIC LIGHTS AND WIRES.

Years.	No. of Risks Burned.	Property Losses.
1886	29	$460,259
1887	66	681,930
1888	91	1,587,213
1889	357	5,533,820

I call special attention to the extract from the Boston Fire Marshal's report, which begins by "presuming" something, and after tracing a metallic circuit all over the city, in and out, up and down, it ends in proving nothing. But yet this book, which modestly says, on the first page, that it is, "an *invaluable* compilation of fire statistics," didn't have the fairness to print the above table, with its authority for the five and one-half millions loss charged to electricity, side by side with the yellow and red diagram, or to refer the reader to it by foot-note or other means. Nor did it have the fairness to refer the reader to the fact that its pages showed only 74 fires charged to electricity in 1889, as against 91 in 1888; a decrease in the number of accidents from that cause of about 19 per cent.; nor to explain in the table above quoted that of the 357 risks burned by electrical causes, 283 burned by exposure, or in other words, because the fire got away from the fire department. Nor did it have the fairness to refer, even briefly, in connection with the diagram, to the fact that its pages showed 254 fires charged to lamps and lanterns, 241 to gas jets, and 105 to candles, each of them outranking in numbers the electric fires.

I will presume it was an oversight, since presumptions are in order.

The first bad effect of this highly colored piece of misinformation (I refer to the frontispiece) was to lead an honored gentleman who is famous for truth and wisdom, into expatiation at great length upon the increasing danger and loss by fire from electrical causes, in the face of facts and statistics (contained in the same Fire Tables) to the contrary. I refer now to the report of the electrical committee presented at the National Board of Fire Underwriters' meeting in New York, last Spring. The report was given wide circulation by the press, the same as any other sensational and alarming report would have been treated.

I will quote a little from the report for the benefit of those who may not have seen it, or who have forgotten it if they did see it.

"The great problem before us to-day, however, is the management of the various systems of electric lighting so as to ensure safety from fire. When such lights were first introduced, underwriters congratulated themselves that at last the long sought means of illumination without danger had been found. No matches, no kerosene explosions, no swinging gas brackets would hereafter vex them, but a steady, safe and brilliant light, which could do no possible harm, had come among us and all were happy.

"It did not take many months, however, to discover that the electric light was not the harmless thing we had imagined, but that it was a most prolific source of danger, and its introduction has cost the insurance companies more than any method of lighting heretofore in use. It has come to stay, and some time it will probably be as safe as any light in use, but our knowledge of its properties and of its management must be vastly increased before that time appears. We see the danger, but as yet are too ignorant to point out the remedy. What yesterday seemed a safe method of installation, to-day proves dangerous, and what we regard as safe to-day, is likely to develop danger to-morrow. We can only wait and study."

And now I find in the editorial columns of the Cincinnati *Commercial Gazette*, the following:

"That nearly 80 per cent. of the fire losses in Boston in the last year should have been caused by electricity is remarkable. It may not argue so much the danger generally of electrical appliances, as a lack of knowledge and carelessness in their uses in the city of Boston. Coal oil lamps, tallow dips, gas and steam boiler furnaces, would cause many fires if proper attention were not given them."

Verily, falsehood seems, sometimes, more potent than truth.

Does the journal which gave birth to the foregoing squib know that "coal oil lamps" caused 109 fires in Boston last year; that "gas" caused 86, and that "steam boilers and furnaces" caused 108, while electricity is only charged with 9?

The official returns give no account of fires caused by "tallow dips," presumably because Boston, unlike Cincinnati, has passed that primeval period where such means of lighting is employed.

If one of the fires from coal oil lamps had happened on the 28th day of November last, in the "Brown Durell" building, and had spread until it had destroyed nearly four million dollars worth of buildings and merchandise, would this same journal have thought it "remarkable that nearly 80 per cent. of the fire losses in Boston" had been caused by coal oil lamps? Would it have reasoned that such a result might "not argue so much the danger generally" of coal oil lamps, "as a lack of knowledge and carelessness in their uses in the city of Boston"?

Would it not have argued in that case like this: "It is not strange that a coal oil lamp should cause a fire, but what kind of a fire department has Boston got, to allow a fire to spread to such an extent in broad day-light, on a holiday, when the streets were not crowded and everything was favorable to prompt action."

Perhaps a fire caused by electricity is different from any other fire; may-be the electricity that escapes from a broken wire accelerates the spread of the flames; if so, the journalists who write squibs and make fire tables ought to tell us.

Boston's Fire Marshal intimates as much in his last report. He says: "Especial precaution should be adopted to prevent fires from electricity and spontaneous combustion, for the reason that when they do occur the loss is apt to be heavy on account of their liability to gain great headway *and to burn with unusual rapidity.*" Great Scott! where is the analogy? Are not the electrical fraternity in their "infancy" quite as much as the science? Why haven't they found out this peculiar quality of the electrical fire and its similarity to spontaneous combustion?

As the immediate outcome of the *one* fire in Boston which caused "nearly 80 per cent." of the losses last year, the city has increased its fire department by purchasing six new steamers and other apparatus to replace obsolete and worn-out machines, and about $500,000 have been appropriated by the city government to make its fire department efficient.

If that loss was chargeable wholly and unquestionably to an abnormal increase of danger from electricity, as the essayists herein referred to would lead us to believe, is it not more probable that the city would have taken some action to abate the growing evil, to prohibit the use of this "most prolific source of danger," instead of adding to its fire apparatus and thereby, in its very action, admitting the great loss to have been due to *inadequate means for coping with fire?*

Contrast the following information extracted from the Fire Marshal's report referred to, with the yellow and red picture of the Chronicle Fire Tables:

"The number of fires caused by electric lights and wires is eight-tenths of one per cent. less than last year, or a decrease of 40 per cent. from the total number caused by electricity last year."

"There has been an increase in the number of kerosene fires of two per cent."

"With almost surprising regularity matches continue to cause their 20 per cent. of Boston's yearly fire loss."

"Eleven per cent. of the fires occurring during the year were caused by gas, of which more than three-quarters were absolutely careless, if not reckless."

"With the exception of matches, kerosene has more fires to answer for than any other cause, over 14 per cent. being attributed to it."

"While less than two per cent. of the total number of fires are attributed to electric wires and lights, the loss resulting from them is placed at over 79 per cent. of the year's total, the larger part of which was occasioned by the great fire of November 28th, on which the loss is estimated at $3,859,402."

"When the great increase in the use of electricity from year to year is considered, it is certainly encouraging to note that the percentage of increase in the *number* of fires caused by it is proportionately very small, while this year's record even shows a decrease."

In conclusion, I would suggest that the Chronicle Fire Tables use as a frontispiece next year, a picture of Master George Washington at the time he was in the tree business; and that it live up to the principles suggested by the picture.

Stephen E. Barton.

Boston, Sept. 20th, 1890.

* "It is presumed that the tenth circuit wire of the Messenger Company must have been crossed either by an electric light or power wire, or some other wire, by the Electric Time Company's, or in connection with one of these, thus causing it to fuse in its weakest spot. The tenth circuit, which is a metallic one, runs from the company's cable at 17 State street to 214 Washington street, across to the Rodgers building, to Young's Hotel, to the Court House, across on the Museum building, over to 222 Tremont street, and from there to 32 and to 20 Pemberton square.—*From the Special Report of the Fire Marshal of the City of Boston on the Kingston street fire, November* 28, 1889."

The Ocean Cables of the World.

According to the latest report of the International Bureau of Telegraph Administrations, writes Herbert Laws Webb, in October *Scribner's*, the submarine telegraph system of the world consists of 120,070 nautical miles of cable. Government administrations own 12,524 miles, while 107,546 are the property of private companies. The total cost of these cables is in the neighborhood of $200,000,000. The largest owner of submarine cables is the Eastern Telegraph Company, whose system covers the ground from England to India, and comprises 21,860 miles of cable. The Eastern Extension, which exploits the far East, has 12,958 miles more. Early in last year the system of West African cables, which started from Cadiz only six years ago, was completed to Cape Town, so that the dark continent is now completely encircled by submarine telegraph, touching at numerous points along the coast. More than 17,000 miles of cable have been required to do this, and several companies, with more or less aid from the British, French, Spanish and Portuguese governments, have participated in carrying out the work.

The North Atlantic is spanned by no less than 11 cables, all laid since 1870, though I think not all are working at the present time; five companies are engaged in forwarding telegrams between North America and Europe, and the total length of cables owned by them, including coast connections, is over 30,000 nautical miles.

New Snow Plow and Snow Sweeper.

MANUFACTURED BY THE THOMSON-HOUSTON ELECTRIC COMPANY.

Past experience in operating electric railways in winter has demonstrated the fact that some appliance is needed for keeping the tracks as free from snow as possible. That the Thomson-Houston Electric Company fully realized this is shown by the forethought manifested in preparing the snow plow and snow sweeper shown in the accompanying illustrations.

The details of the snow plow are as follows: Length over all, 20 feet; width, seven feet; height from rail to floor of car, three feet six inches. The truck has four 36-inch wheels, in front of which is placed a digger which scrapes the snow from the track, thereby securing a good contact for the wheels. These diggers or scrapers are controlled by levers placed at each end of the car, and may be raised and lowered at will. One of the main plows is placed diagonally across the car, one end being in front of the forward wheel on one side, the other end coming out between the front and rear wheels on the opposite side, at an angle of about 60 degrees. By placing the plow in this manner a position is secured where the least oscillation occurs. Although the plows extend two feet beyond the wheels, each is provided with an extension, by means of which a path of any desired width, depending upon local conditions, can be plowed out. The second main plow is hung parallel to, and in the same manner as the first, each however, being independent, and controlled by levers placed upon the car platform. One or both can be used as the circumstances require. The plows are kept at a proper angle by means of chains and iron rods, so arranged as to permit great freedom of movement in a vertical direction.

The car is propelled by two 20-horse-power motors of the consequent pole type, one being geared to each axle by means of sprocket chains and chain gear wheels, and are capable of propelling a car at a speed of 10 miles an hour. The sprocket chains run as slow as possible, since the total reduction in speed is made by gears on the motor frames. They are enclosed in closed iron boxes. In circuit with the motors is placed a reversing switch and rheostat, also placed in a closed iron box. The trolley arm is supported by a post placed in the center of the car platform, and which is also used as a support for a number of incandescent lamps. The car can be operated in either direction.

The car for the snow sweeper is of the same dimensions as that used for the plow, the wheels being 36 inches in diameter and mounted on a 3½-inch axle. The motors for driving the car are of 15 horse-power each, and are entirely independent of the motors used for driving the brushes, being provided with separate reversing switch and rheostat, enclosed in an iron box, and placed on the platform in easy reach of the operator. The motors for operating the brushes are placed on the car platform, with a shaft parallel to that of the broom, and connected to it by means of sprocket chains, so as to run at a speed of 200 revolutions per minute. The brushes, which are placed in advance of the truck, are two in number, and are made in sections to facilitate taking apart and placing upon the drum to which they are fastened. On the platform of the car on both sides are handles operating clutches by means of which the brooms can be thrown in or out of operation. Levers are also provided for raising and lowering the brooms, thereby rendering it possible to operate them at any desired height. To insure the snow being thrown off the track, the brooms are set at an angle of 60 degrees to the rail. The electrical connections are the same as found on the passenger cars, the motors for propulsion being connected in multiple, but independently of the motors used for driving the brushes. The current is taken from the overhead conductor by means of a trolley, supported on a post eight feet high placed in the center of the car. Around this post are grouped incandescent lamps which are employed when the car is required for night service. Both the snow-plow and sweeper are made for severe work, and have proved in previous tests to be fully capable of responding to every demand made upon them.

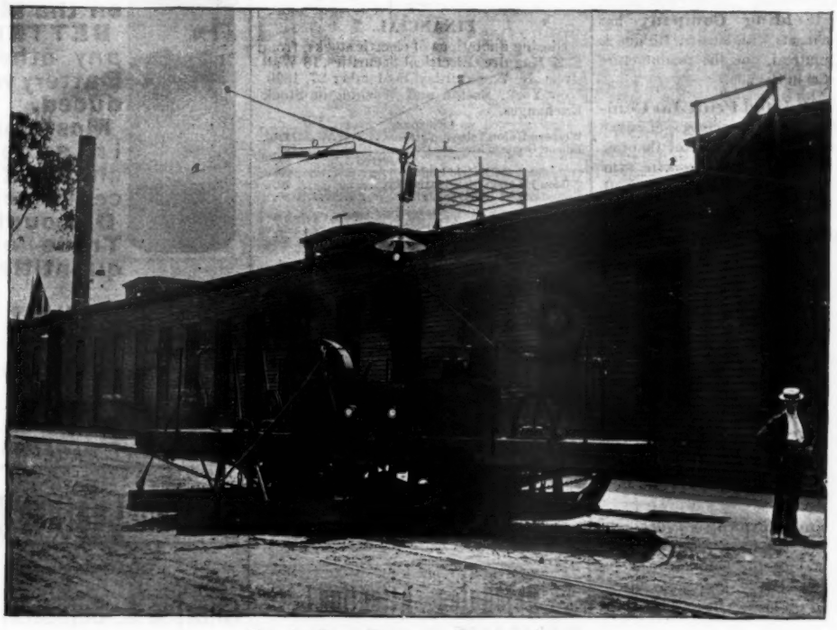


FIG. 1.—SNOW PLOW FOR ELECTRIC ROADS.

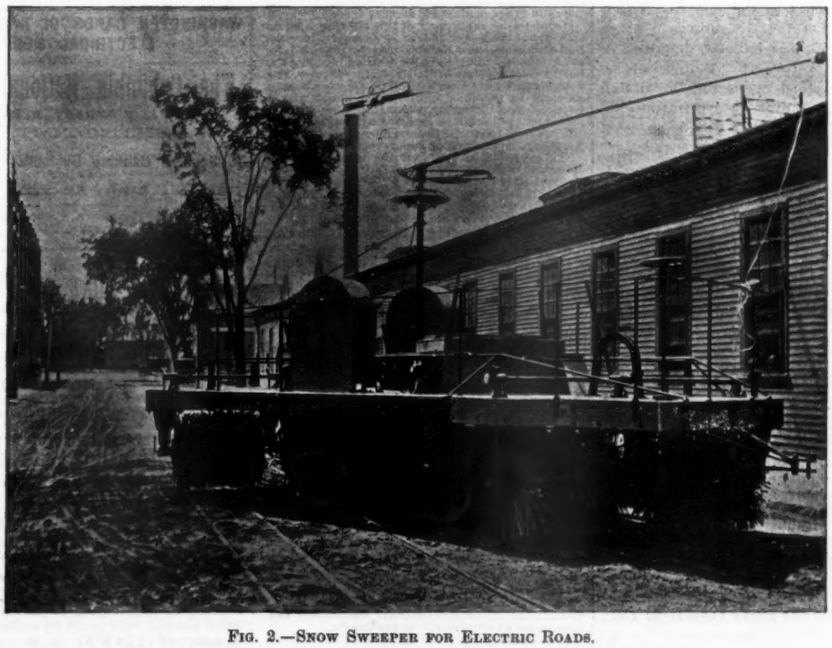


FIG. 2.—SNOW SWEEPER FOR ELECTRIC ROADS.

Change of Ownership in a Leading Electrical House.

Stanley & Hall, electrical house furnishings, 32-34 Frankfort street, this city, is now the name of the firm until very recently known as Hazazer & Stanley; Mr. E. W. Hazazer, who has been a worker in the electrical field for many years, retiring; he has not as yet determined upon his future movements. Mr. A. F. Stanley, the senior partner in the new firm is as widely and popularly known as any man in this country in the electrical supply business. Mr. Harry Hall, the junior partner, has been associated with Hazazer & Stanley for some time past. He is an energetic and pushing young man. We wish the new firm every success.

The first electric railway in Louisiana was successfully started at Shreveport on September 22. It is run on the Thomson-Houston overhead system.

The Fifth Avenue Railroad Company, of this city, has elected the following directors: Thomas B. Musgrave, Lewis May, Wm. H. Lee, Edward V. Loew, Isaac B. Newcombe, A. S. Hatch and Eugene S. Goadby. President Musgrave says that consent to the construction of the road had been secured from the holders of the $16,000,000 worth of property, leaving only $4,000,000 more to secure. The road, when built, is to extend from Canal street, through South 5th avenue and 5th avenue to Harlem. It is proposed to use electricity as the motive power.

Early History of the Telegraph.

In a communication to the New York *Sun*, Mr. James D. Reid, United States Consul at Dunfermline, Scotland, presents the following corrections and information regarding the early history of the telegraph in this country:

I have just received copies of the *Sun* of August 18 and 21. Under the caption, "The First Telegraph Superintendent," and in connection with an interesting article occasioned by the recent death of my friend Jeptha H. Wade, of Cleveland, a very kind reference is made to me as "the first telegraph superintendent the world ever saw," and who "is doing his country active service as United States Consul at Dunfermline, Scotland." This statement was met with filial promptness of denial by Mr. Stephen Vail, of Morristown, in your issue of August 21, and Mr. Vail very correctly gives the honor their appointment ceasing with the delivery of the line to the government and the abandonment of the line to private purchasers by the Postmaster-General as "a thing that wouldn't pay."

I became superintendent when the first telegraph line was built for commercial uses, and superintended both construction and management, and of which the government experimental line soon formed a part. And it seems a very curious fact that such, for a time, was the dearth of the material out of which telegraph superintendents were made, that for several years I was superintendent of four, and, for a time, of five, distinct telegraph companies performing all my duties without aid of secretary, assistant or clerk, and receiving a comfortable salary from each.

Naturally, I delight in such a memory of work and fellowship such as marked these early heroic years, when labor to all was an assigned to me to Prof. S. F. B. Morse for whom his father, Alfred Vail, acted as assistant.

Although I am not at all anxious publicly to claim the peculiar and very interesting place my friends and you seem to take so much pleasure in assigning to me, there is this to be said as a matter of correct telegraph history, that neither Prof. Morse, with whom I was on the most intimate terms, nor Mr. Vail, who was also my very valued friend, ever had, at any time, any supervision or official direction of any kind with any telegraph line built for commercial uses or employment. Prof. Morse superintended the construction of the government experimental line between Baltimore and Washington, Mr. Vail acting as his assistant, honor and a glory. I am grateful that I retain in my new sphere all my ancient love for work, and that I have health far in advance of that with which I entered my telegraph life in 1845.

One error made by one of the prominent scientific papers in New York, may as well be corrected. Henry S. Potter, of Rochester, N. Y., was the first president of the Western Union Telegraph Company. Hiram Sibley became president in 1851. Jeptha H. Wade was elected president in 1866, refused re-election July 10, 1867, and was succeeded by Wm. Orton, who died April 22, 1878, when, after a short interval, Dr. Green became and is now president. The name of "Western Union" was given to the company by Ezra Cornell.

KINDRED INTERESTS

The Thomson International Electric Welding Company has made arrangements with Messrs. Holden & Company, Montreal, for the manufacture of its apparatus in Canada.

The Consolidated Fruit Jar Company, of this city, has recently sent out an unique calendar. The back is of tin ornamented with samples of fuse wire symmetrically disposed. It ought to wear well.

The Wenstrom Dynamo and Motor Company, Baltimore, are fitting up their new factory with the very finest machinery, and no money will be spared to make it complete in every detail. They propose to be in a position to fill all orders promptly.

The Evans Friction Cone Company, Boston, has just taken the contract for fitting up the entire plant of the Derby Gas Company, Birmingham, Conn., with their system of driving dynamos. This station will be operated partly by water and partly by steam power, and will, it is said, be a model station in every respect.

The Edison Company is doing a large amount of foreign business, one of the recent contracts being for the equipment of the St. Johns City Railway Company, of St. Johns, New Brunswick, which is one of the strongest roads in the Dominion. The contract was closed through Mr. John F. Zobley, of New York, and the Edison system was determined upon by Mr. Zobley after a most thorough and careful examination of the different railway systems of this country.

The Complete Electrical Construction Company, of this city, has just commenced installing the electrical equipment of the new steel ship "Vigilancia," launched recently at Chester, Pa. This is a sister ship of the "Segurança," whose electrical plant was recently described in the ELECTRICAL REVIEW. Both vessels belong to the United States and Brazil Mail Steamship Company. The electrical equipment of the "Vigilancia" will be an exact duplicate of that on the "Segurança."

Westinghouse Electric and Manufacturing Company's business has received an extraordinary boom during the last month. The shops are now running at their full capacity day and night and the company has still orders ahead to keep it busy the entire Winter. This large increase in the work is especially caused by the wonderful success of the street car motor lately brought out. Several roads have been equipped already and their operation has proved to give more than ordinarily satisfaction. The manufacture of alternating current apparatus has also gained considerably, and the new Westinghouse system of alternating current arc lighting is rapidly becoming the popular method of illumination. Among the contracts the company has recently obtained are St. Paul, Minn., for an increase of apparatus to the extent of 3,000 incandescent lights capacity; Arlington Heights, Texas, 500 lights; Rochester, Pa., an increase of 500 lights, and Colorado Springs, Col., an increase of 1,500 lights.

The National Pipe Bending Co., New Haven, Conn., manufacturers of the National feed water heater, are building an extensive factory about 100 feet square, to meet the increase in their business. They report the sale this last month of 47 heaters, a large number of them being for electric light plants: One 1,200 h.p. for the Edison Company, at Paterson, N. J.; one 1,000 h.p. for the Thomson-Houston plant at Lynn, Mass.; one 1,000 h.p. to Waterbury, Conn.; one 300 h.p. to Meriden, Conn.; one 300 h.p. to Toronto, Ont.; one 400 h.p. to Memphis Electric Company, Memphis, Tenn.; one 300 h.p. to Val Dosta Electric Company, Georgia; one 150 h.p. to Ware, Mass.; one 150 h.p. to Abbeville, S. C.; one 400 h.p. to Cumberland, Md.; one 100 h.p. to Anderson, S. C.; one 200 h.p. to Denver, Col.; one 150 h.p. to Edgefield, Ga.; one 200 h.p. to Newark, N. J.; one 200 h.p. to Washington, Ga.; one 200 h.p. to Belleville Electric Company, Belleville, Ill.; one 150 h.p. to Electric Light Company, Sanata, Mexico; one 150 h.p. to Norfolk, Va.; one 200 h.p. to Richmond, Va.; one 150 h.p. to Providence, R. I.; one 100 h.p. to Minneapolis, Minn.; one 150 h.p. to Far Rockaway, L. I.

FINANCIAL.

Closing quotations of electric stocks, from F. Z. Maguire, Electrical Securities, 18 Wall street, N. Y., Saturday, September 27, 1890. New York, Boston and Washington Stock Exchanges.

NEW YORK.	
Western Union Telegraph Co	93¼.
Edison General Electric Co	*90.
" " " Deferred	85.
Consolidated Electric Light	60.
Edison Electric Illuminating Co	70.
United States Electric Light	30.
BOSTON.	
Thomson-Houston Electric Co	49.
" " " Preferred	25⅞.
" " " Series C	
" " " Series D	6.
" International	
" Welding Co	200.
" European Welding Co	60.
Ft. Wayne Electric Co	10¾.
TELEPHONE:	
American Bell	226.
Erie	48¼.
New England	51.
Mexican	.90
Tropical American	
MISCELLANEOUS:	
Edison Phonograph Doll	2.
WASHINGTON.	
Pennsylvania Telephone	26.
Chesapeake and Potomac	73.
American Graphophone	16¼.
United States Electric Light (Washington)	*135.
Eckington and Soldiers' Home Railway	68¾.
Georgetown & Tenallytown	54.
PITTSBURGH.	
Westinghouse Electric Mfg. Co	36.

*Ex. Dividend.

Delegates, Attention!

DELEGATES who expect to attend the Annual Convention of the American Street Railway Association, which convenes at the Hotel Iroquois, Buffalo, N. Y., Oct. 15th, will be pleased to learn of the reduced rates offered on this occasion by the Michigan Central Railroad, "the Niagara Falls Route."

The liberality shown by this enterprising road should be appreciated by all who attend the Convention from Western points.

The rate offered by the above company is that of a fare and one-third for the round trip, Chicago to Buffalo and return. Tickets at this rate will be sold on what is termed the "certificate plan," *i. e.*—you pay the regular rate to Buffalo, viz., $14, and secure a certificate with which a return ticket can be purchased for $4.20, making a total of $18.20 for the round trip, against $28 regular fare.

Owing to the importance of this meeting, a larger attendance than ever before is assured. In order that ample accommodations may be provided for all, it is important that those desiring Sleeping Car Berths communicate with Mr. L. D. Heusner, Passenger and Ticket Agent, 67 Clark Street, Chicago, as early as possible, stating what space will be required, also indicating what train they wish to take, and berths will be assigned to them.

It is understood that these reduced rates apply to Members, Supply Men or members of their families.

The probabilities are that the majority of the Delegates will leave Chicago on the vestibuled Limited Express, at 3.10 P. M., Tuesday, October 14th, arriving in Buffalo the following morning at 7.25. Tickets, however, are good on any of the regular trains shown in the appended schedule.

Leave Chicago, foot of Lake Street, as follows:

Central Standard Time.	No. 20. North Shore Lmtd.	No. 6 Vestibd N. Y. & Bos. Ex.	No. 10. Fast Atlc. Ex.	No. 16. Night Ex.
Lv. CHICAGO	P. M.	P. M.	P. M.	P. M.
(ft. Lake st.)	12.20	3.10	10.10	9.00
" 23d st	12.28	3.18	10.23	9.11
" Hyde Park	s12.40	s 3.30	s10.35	s 9.24
			A. M.	A. M.
" Kalamazoo	3.58	7.04	3.35	1.18
" Battle Creek	4.30	7.37	4.25	2.03
" Jackson	5.38	8.52	6.15	3.40
Ar. Det. (ft. 3d st.)	7.30	10.45	9.20	6.20
Lv. Detroit	7.45	10.55	9.50	6.40
		A. M.	P. M.	
Ar. Niagara Falls		5.40	4.13	P. M.
" Buff. (Cnt. time)		6.25	4.55	2.15
" Buff. (Etn. time)		7.25	5.55	3.15

TO CAPITALISTS.

A **Fortune** in the near future to a capitalist who can afford to invest a few thousand dollars at present in a **wonderful** and **simple patented invention.**

By the use of the invention, fire and death by **electric wires are absolutely prevented.**

Infringers are already making free use of the invention, but capital can use them and require royalty **upon every device so far made.**

The invention is covered by Letters Patent of the United States. The patent is for **sale at about one per cent. (1%) of its true value.**

The purchaser of the patent will own that which the mayors and boards of control in every city will soon require in use in every electric light station. **It has already met with the approval of the public, as shown by evidence on record.**

The title of the patent is clear and valid, and the claims cover the invention so broadly that there is no room left whereby an infringer can escape paying royalty and damages.

The present owner of the patent has no capital whatever, and no influence, and is willing to sell out at a very low figure.

The patent may be inspected and examined by the proposed purchaser's attorney or expert, and the whole history of the case through the Patent Office, with all references and objections, will be cheerfully submitted.

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ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON SEPTEMBER 23, 1890.

436,717 Holder for phone-receivers; Jehiel T. Moore, Minneapolis, Minn.

436,728 Motor-armature car wheel; Edmund Wagemann, Little Rock, Ark., assignor of six-sevenths to John D. Adams, Dean Adams, Oscar Davis, John W. Davis, Horace G. Allis and John B. Jones, of same place.

436,733 Insulating material; James W. Easton, New York, N. Y., assignor to Minturn Smith, Plainfield, N. J., and Wm. D. Perry, Brooklyn, N. Y.

436,740 Printing telegraph; John B. Odell, Chicago, Ill., assignor to the Printing Telegraph Co., of Illinois, same place.

436,777 Mechanical and electrical railway signal; Benjamin R. Davidson, Fayetteville, Ark.

436,779 Electric motor car truck; Albert W. Goss, Amesbury, Mass.

436,804 Electric osteotome; Milton J. Roberts, New York, N. Y.

436,814 Electric arc lamp; Auguste Wagniere, Los Angeles, Cal.

436,843 Electric controller for power mechanisms; Robert D. O. Smith, Mishawaka, Ind.

436,857 Coupling for electric wires; Forrest R. Jones, Kearney, Neb., assignor of one-half to James G. White, New York, N. Y.

436,864 Electric heater; Ernest Abshagen, Chicago, Ill., assignor, by direct and mesne assignments, of five-eighths to Alfred W. Brewerton, Geo. M. Clark, Henry M. Hubbard and Wm. H. Hubbard, all of same place.

436,874 Electric contact device; John J. Hoppes, Springfield, Ohio.

436,895 Process of electro depositing aluminum; John A. Jeancon, Newport, Ky.

436,901 Speed regulator for dynamos; Samuel E. Nutting, Chicago, Ill.

436,910 Electrical weighing machine; William Snelgrove, Kings Norton, England.

436,923 Electric railway; Hosea W. Libbey, Boston, Mass.

436,952 Thermal cut-out; Geo. H. Whittingham, Baltimore, Md., assignor to the Automatic Electric Switch Company, same place.

436,961 Portable electric fire alarm; Francis R. Upton, Orange, N. J., and Fernando J. Dibble, Peabody, Mass.

436,964 Commutator brush; Chas. Wirt, Orange, N. J., assignor of one half to Francis R. Upton, same place.

436,968 436,969 Method of and apparatus for drawing wire. 436,970 Apparatus for transmitting power; Thomas A. Edison, Llewellyn Park, N. J.

436,979 Electric signal for velocipedes; Charles G. Jiran, Chicago, Ill.

436,990 Automatic gas lighter and extinguisher; Nelson Newman, Springfield, Ill., assignor of two-thirds to Geo. A. Sanders and Samuel J. Willett, both of same place.

437,008 Holder for electric light shades; Lewis J. Atwood, Waterbury, Conn., assignor to the Plume & Atwood Manufacturing Co., same place.

437,010 437,012 Telephone exchange system. 437,011 Artificial resistance; Edward M. Bentley, Boston, Mass.

437,044 Method of impregnating parts of electrical apparatus; Frederick L. Rawson, London, England, assignor to the Company, Woodhouse & Rawson, United (Limited), same place.

437,069 Electric distance heat indicator and alarm; Frederick W. Wiesebrock, New York, N. Y., assignor of one-half to Richard M. Bruno, same place.

437,111 Rheostat; Josephus H. Gunning, New York, N. Y.

437,116 Coupling for electric wires; James J. Hinphey, Bound Brook, N. J., assignor of one-half to Benjamin B. Matthews, same place.

437,126 Underground electric conduit; Charles E. Loth, Troy, N. Y.

437,158 Electric railway; Rudolph M. Hunter, Philadelphia, Pa., assignor to the Electric Car Co. of America, same place.

437,610 Dynamo electric machine or motor; Max Mayer, New York, N. Y., assignor to David Hirsch, same place.

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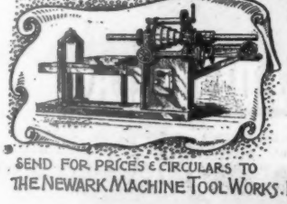
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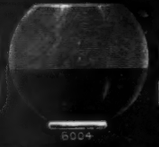
GLOBES  **SHADES**
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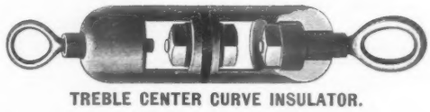

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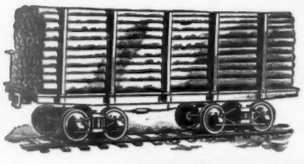

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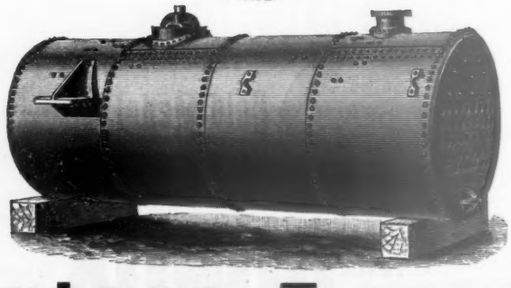

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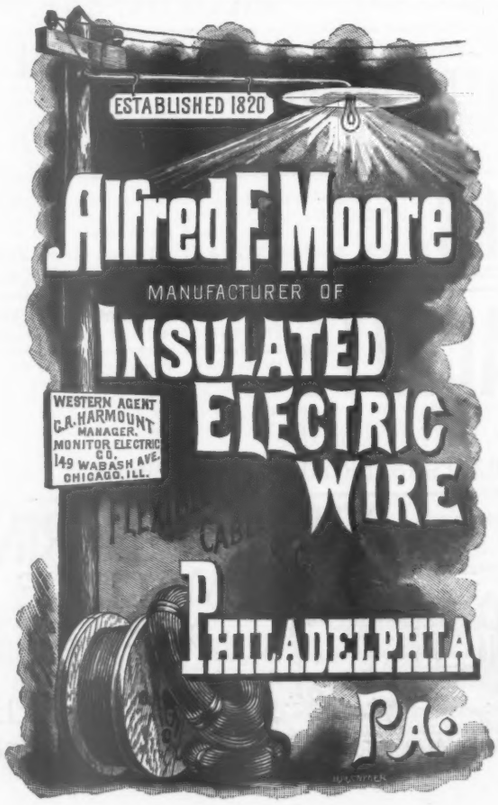

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Hutchinson Water, Light and Power Co., Hutchinson, Kan.
Walworth Light and Power Co., Boston, Mass.
No. Attleboro Steam and Electric Co., Attleboro, Mass.
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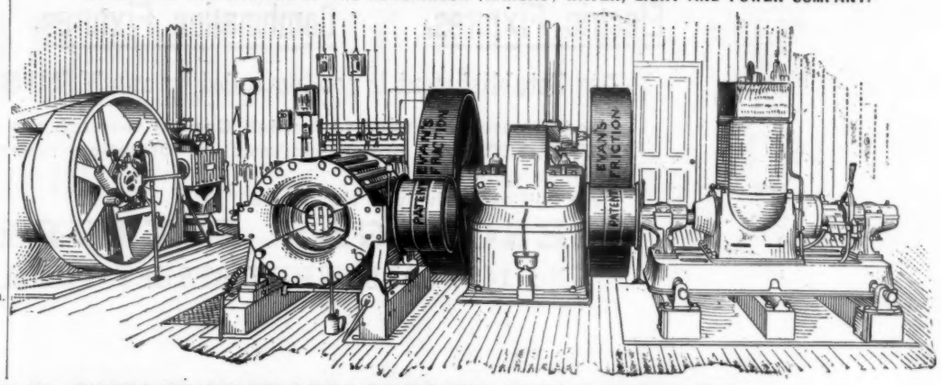

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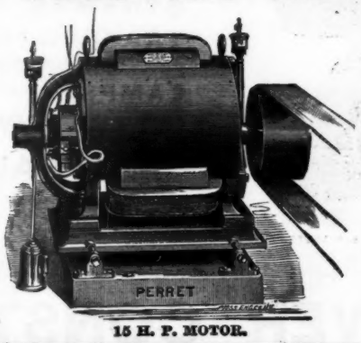

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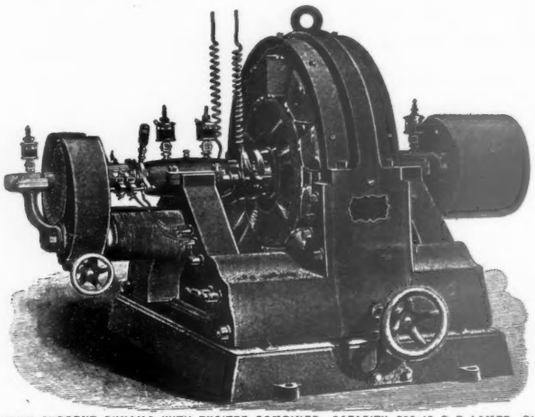
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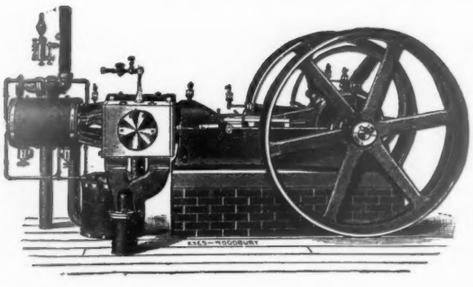

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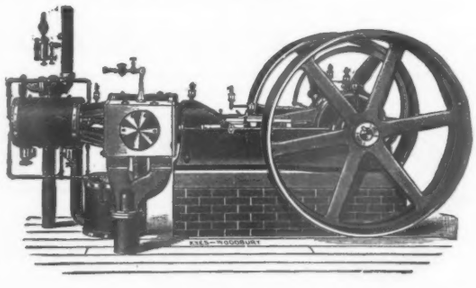

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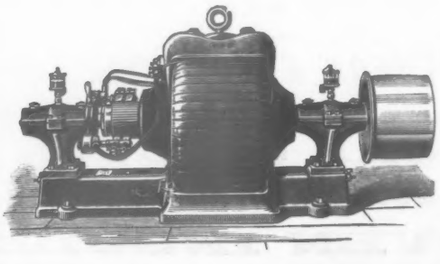

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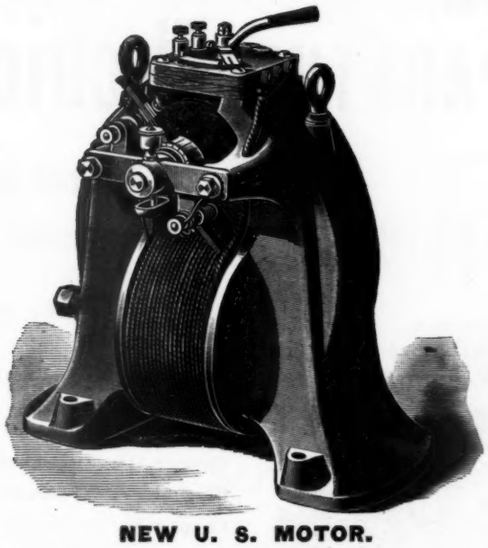

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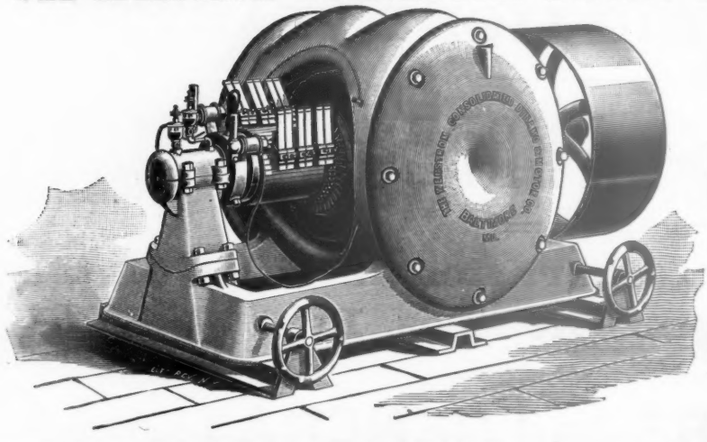

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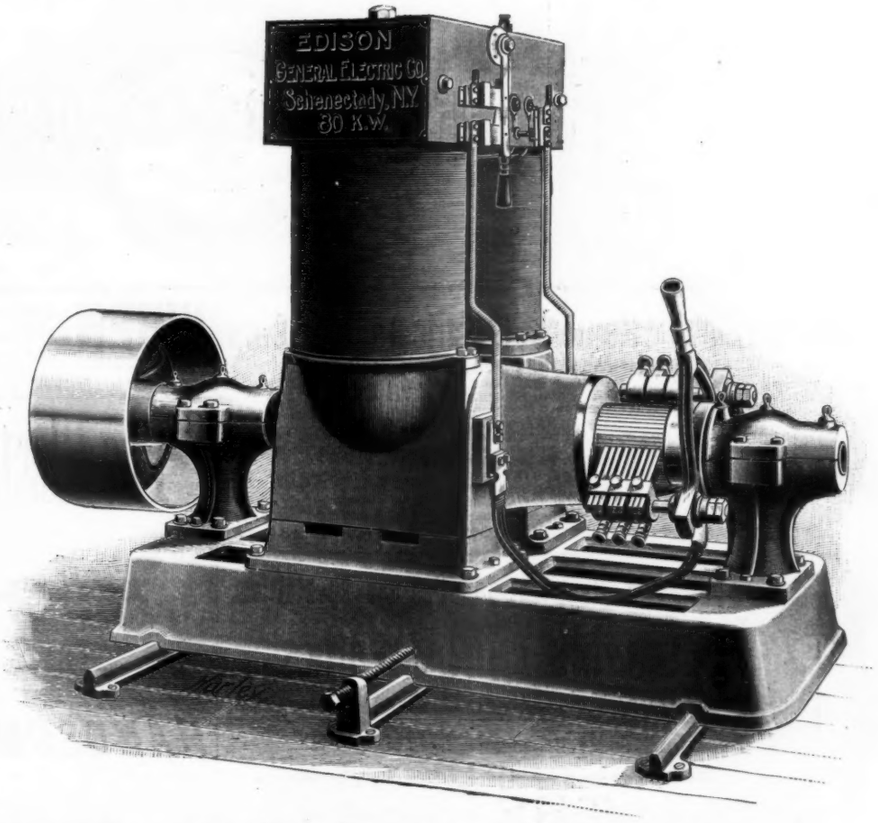

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C	.....	10	.....	.....	6.3	1½		530
C	.....	.....	.....	25	8.0	2		530
E	16	.....	.....	.....	12.0	2¼		780
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G	.....	35	.....	.....	21.0	4		1,360
G	.....	.....	45	.....	21.0	4		1,360
G	.....	.....	.....	70	21.0	4½		1,360
H	40	.....	.....	.....	29.7	6		1,750
H	.....	50	.....	.....	30.0	6		1,750
H	.....	.....	64	.....	29.5	6		1,750
I	52	.....	.....	.....	38.0	8		2,290
I	.....	65	.....	.....	38.6	8		2,250
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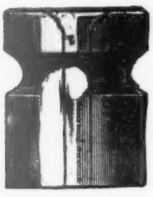

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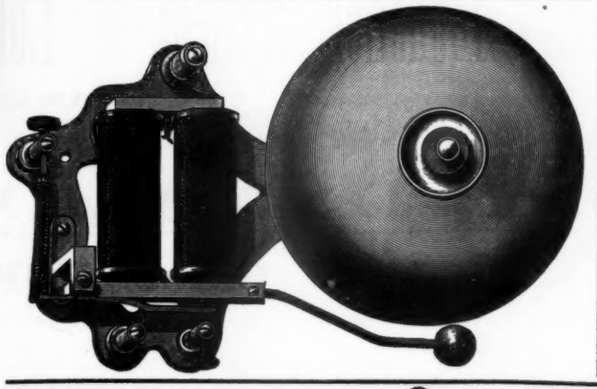

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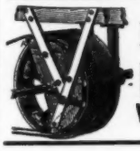

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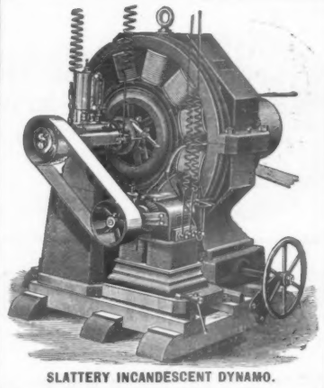

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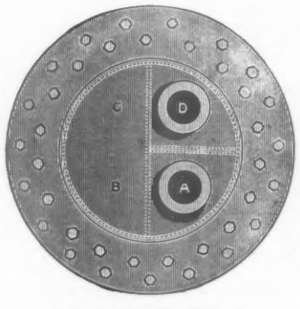

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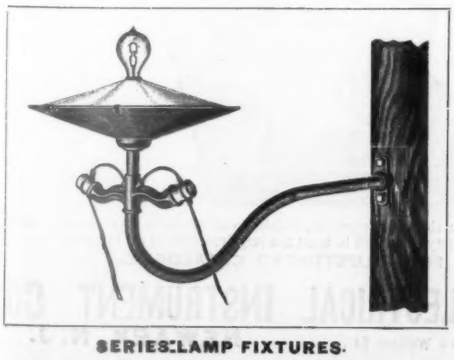

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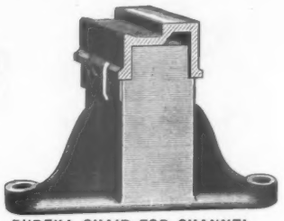

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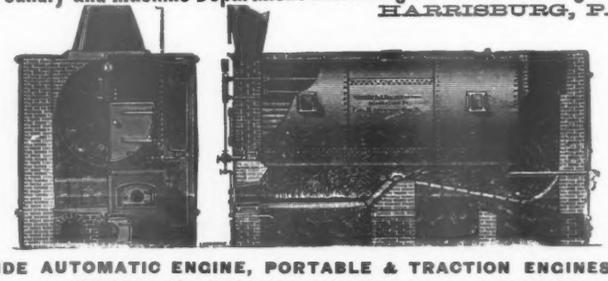

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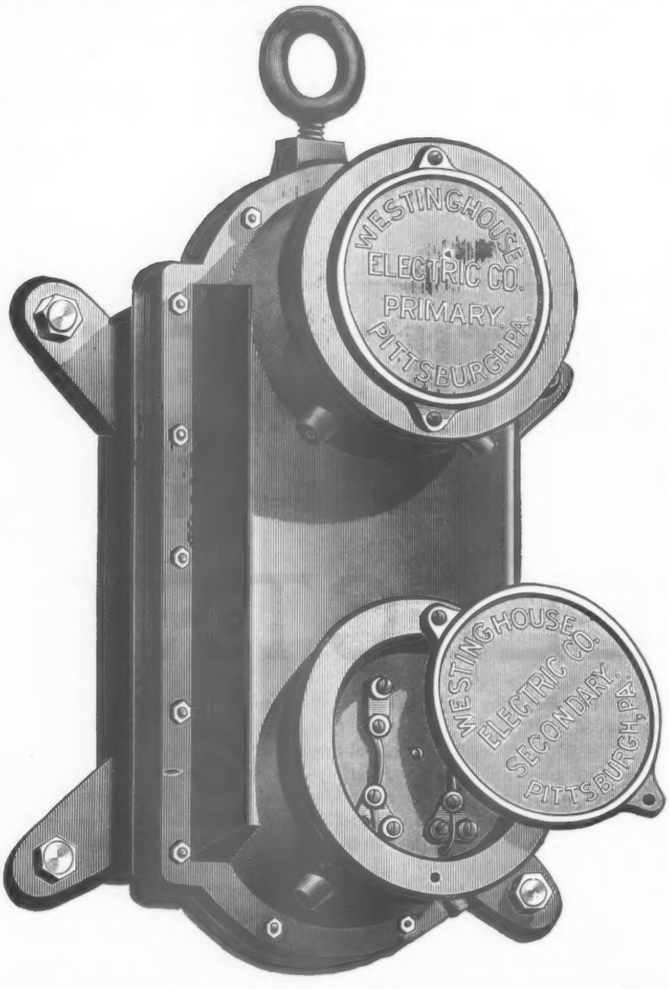

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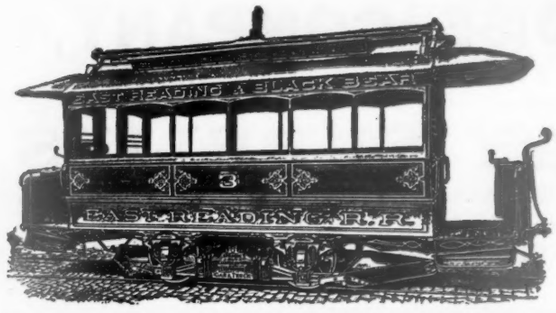

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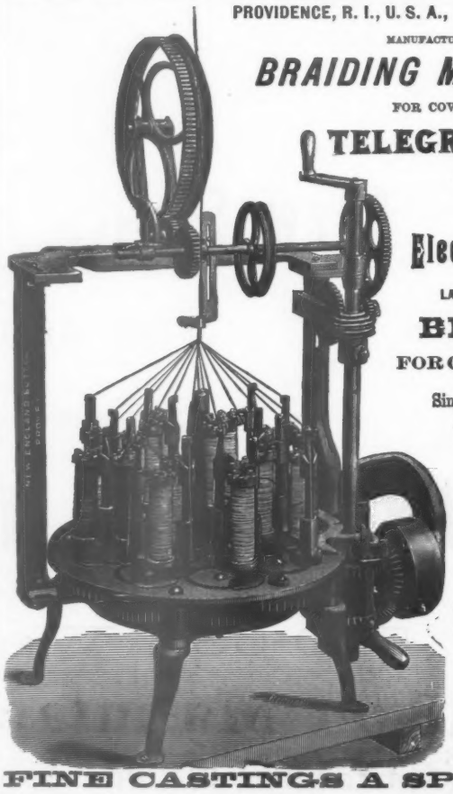

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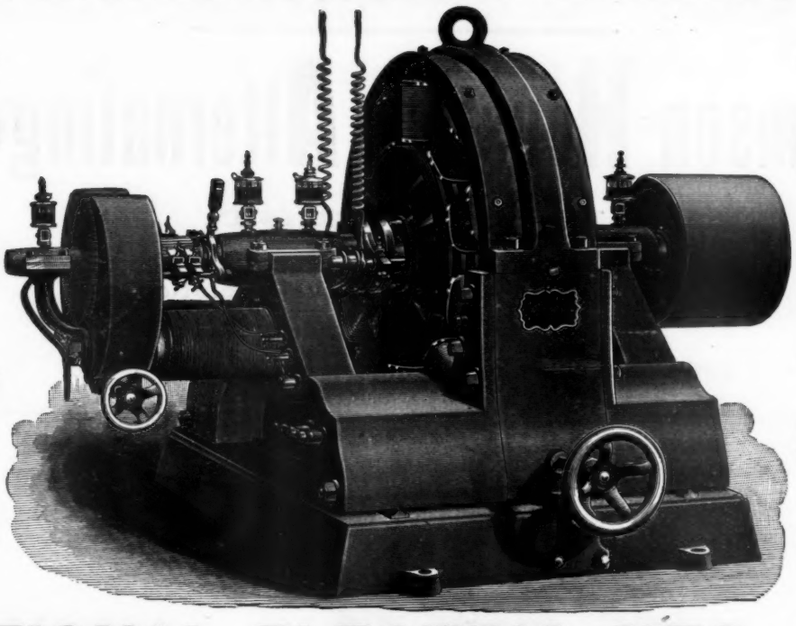

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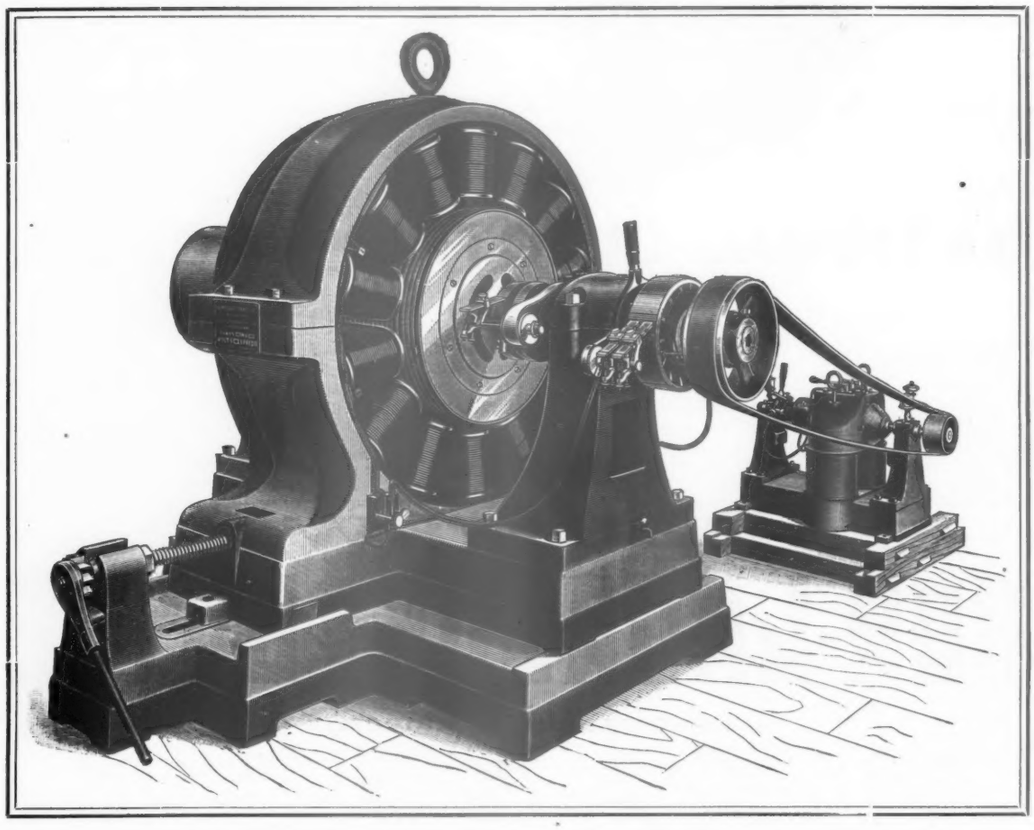

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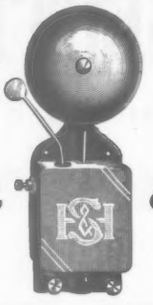

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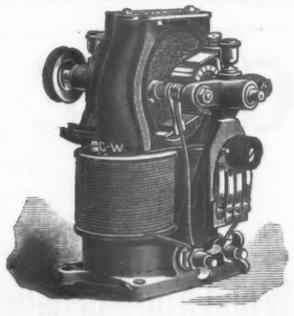

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